

Adelman, M. (1982). FY 1980 episode of medical care cost comparison: VA medical centers compared with community hospitals affiliated with medical schools-medical and surgical acute care episodes, veterans administration., Veterans Affairs Administration, Dept. of Medicine and Surgery.

Allison, J. G. and H. R. Bromley (1996). "Unnecessary preoperative investigations: evaluation and cost analysis." *Am Surg* 62(8): 686-689.

In keeping with national efforts to curb escalating health care costs, the necessity of multiple preoperative investigations was evaluated in 60 randomly selected ambulatory surgery patient records. Necessity for testing was assessed on clinical indications, and overall cost was calculated from the rates at both the local Department of Veterans Affairs Medical Center (VAMC) and a community hospital. Two thirds of the investigations were deemed to be inappropriate, with derived unnecessary average cost per patient of \$47 and \$80 for the VAMC and community hospital, respectively. Potential savings at the VAMC of \$11,757.50 for the calendar year could have been realized. Education of staff and housestaff is crucial to changing obsolete practice habits. The quality and safety of care would not be compromised by limiting preoperative investigations to only those with clinical indications.

Barnett, P. G. (1997). "Research without billing data. Econometric estimation of patient-specific costs." *Med Care* 35(6): 553-63.

**OBJECTIVES:** This article describes a method for computing the cost of care provided to individual patients in health care systems that do not routinely generate billing data, but gather information on patient utilization and total facility costs. **METHODS:** Aggregate data on cost and utilization were used to estimate how costs vary with characteristics of patients and facilities of the US Department of Veterans Affairs. A set of cost functions was estimated, taking advantage of the department-level organization of the data. Casemix measures were used to determine the costs of acute hospital and long-term care. **RESULTS:** Hospitalization for medical conditions cost an average of \$5,642 per US Health Care Financing Administration diagnosis-related group weight; surgical hospitalizations cost \$11,836. Nursing home care cost \$197.33 per day, intermediate care cost \$280.66 per day, psychiatric care cost \$307.33 per day, and domiciliary care cost \$111.84 per day. Outpatient visits cost an average of \$90.36. These estimates include the cost of physician services. **CONCLUSIONS:** The econometric method presented here accounts for variation in resource use caused by casemix that is not reflected in length of stay and for the effects of medical education, research, facility size, and wage rates. Data on non-Veteran's Affairs hospital stays suggest that the method accounts for 40% of the variation in acute hospital care costs and is superior to cost estimates based on length of stay or diagnosis-related group weight alone.

Barnett, P. G. (1999). "Review of methods to determine VA health care costs." *Medical Care* 37(4 Suppl VA): AS9-AS17.

**BACKGROUND:** Estimates of health care cost are needed to conduct cost-effectiveness research at the facilities operated by the US Department of Veterans Affairs. **METHODS:** The medical literature was

searched for VA studies to characterize different cost methods and identify their advantages and disadvantages. RESULTS: Different methods are appropriate for different studies. Analysts who wish to capture the effect of an intervention on resources used in a health care encounter may wish to create a detailed pseudo-bill by combining VA utilization data with unit costs from the non-VA sector. If a cost function can be estimated from non-VA data, VA costs may be determined more economically from a reduced list of utilization items. If the analysis involves a new intervention or a program that is unique to VA, direct measurement of staff time and supplies may be needed. It is often sufficient to estimate the average cost of similar encounters, for example, the average of all hospital stays with the same diagnosis and same length of stay. Such estimates may be made by combining VA cost and utilization data bases and by applying judicious assumptions. CONCLUSIONS: Assumptions used to estimate costs need to be documented and tested. VA cost-effectiveness research could be facilitated by the creation of a universal cost data base; however, it will not supplant the detailed estimates that are needed to determine the effect of clinical interventions on cost.

Barnett, P. G., S. Chen, et al. (2002). "Cost-effectiveness of a conservative, ischemia-guided management strategy after non-Q-wave myocardial infarction." *Circulation* 105: 680-684.

BACKGROUND: Use of coronary angiography after myocardial infarction has been controversial, with some physicians advocating routine use and others advocating selective use only after documentation of residual myocardial ischemia. The effects of these strategies on economic outcomes have not been established. METHODS AND RESULTS: We analyzed data from a randomized, controlled clinical trial conducted in 17 Department of Veterans Affairs hospitals that enrolled 876 clinically uncomplicated patients 24 to 72 hours after an acute non-Q-wave myocardial infarction. The routine invasive strategy included early coronary angiography with revascularization based on established guidelines. The conservative, ischemia-guided strategy included noninvasive testing with radionuclide ventriculography and exercise thallium scintigraphy, followed by coronary angiography in patients with objective evidence of myocardial ischemia. We measured the cost of hospitalization and outpatient visits and tests during follow-up and calculated the incremental cost-effectiveness ratio. The conservative, ischemia-guided strategy had lower costs than the routine invasive strategy, both during the initial hospitalization (\$14 733 versus \$19 256,  $P<0.001$ ) and after a mean follow-up of 1.9 years (\$39 707 versus \$41 893,  $P=0.04$ ). The hazard ratio for death was 0.72 (confidence limits, 0.51 to 1.01) in the conservative strategy. The conservative strategy had lower costs and better outcomes in 76% of 1000 bootstrap replications, and a cost-effectiveness ratio below \$50 000 per year of life added in 96% of replications. CONCLUSIONS: A conservative, ischemia-guided strategy of selective coronary angiography and revascularization for patients who develop objective evidence of recurrent ischemia is more cost-effective than a strategy of routine coronary angiography after uncomplicated non-Q-wave myocardial infarction.

Barnett, P. G. and A. M. Garber (1996). "The cost of VA-sponsored research." *Academic Medicine* 71(10): 1074-1078.

**BACKGROUND:** Under pressures to reduce health care costs, clinical income is a shrinking source of support for research. Such pressures also threaten research at the medical centers of the Department of Veterans Affairs (VA). VA research is particularly vulnerable because medical care appropriations constitute a large, though unknown, source of support. This study measures the medical care component and the total of VA research funds. **METHOD:** The incremental costs of VA research were estimated from a survey of 497 clinician investigators and data on payroll, facility costs, and research grants and appropriations. **RESULTS:** The incremental costs of VA research totaled \$541.4 million in the 1992-93 fiscal year. This included \$245.6 million in federal appropriations for VA research, \$33.1 million in research grants administered by the VA, and \$262.8 million in support from other VA appropriations. Research added as much as \$219.8 million to VA patient care costs. **CONCLUSION:** The VA is adopting strategies to increase the internal payoff of its research. The fiscal constraints facing VA and other academic medical centers mean that they will be able to support research with their own funds only when it benefits them directly.

Barnett, P. G. and J. H. Rodgers (1999). "Use of the Decision Support System for VA cost-effectiveness research." *Medical Care* 37(4): AS63-AS70.

Barnett, P. G. and R. W. Swindle (1997). "Cost-effectiveness of inpatient substance abuse treatment." *Health Services Research* 32(5): 615-629.

**OBJECTIVE:** To identify the characteristics of cost-effective inpatient substance abuse treatment programs. **DATA SOURCES / STUDY SETTING:** A survey of program directors and cost and discharge data for study of 38,863 patients treated in 98 Veterans Affairs treatment programs. **STUDY DESIGN** We used random-effects regression to find the effect of program and patient characteristics on cost and readmission rates. A treatment was defined as successful in the patient was not readmitted for psychiatric or substance abuse care within six months. **PRINCIPAL FINDINGS:** Treatment was more expensive when the program was smaller, or had a longer intended length of stay (LOS) or a higher ratio of staff to patients. Readmission was less likely when the program was smaller or had longer intended LOS; the staff to patient ratio had no significant effect. The average treatment cost \$3,754 with a 75.0% chance of being effective, a cost-effectiveness ratio of \$5,007 per treatment success. A 28-day treatment program was \$860 more costly and 3.3% more effective than a 21-day program, an incremental cost-effectiveness of \$26,450 per treatment success. Patient characteristics did not affect readmission rates in the same way they affected costs. Patients with a history of prior treatment were more likely to be readmitted but their subsequent stays were less costly. **CONCLUSIONS:** A 21-day limit on intended LOS would increase the cost-effectiveness of treatment programs. Consolidation of small programs would reduce cost, but would also reduce access to treatment. Reduction of the staff to patient ratio would increase the cost-effectiveness of the most intensively staffed programs.

Bauer, M. S., G. F. Kirk, et al. (2001). "Determinants of functional outcome and healthcare costs in bipolar disorder: a high-intensity follow-up study." *Journal of Affective Disorders* 65(3): 231-241.

**BACKGROUND:** Review of published studies reveals few data regarding determinants of the poor functional outcome and high healthcare costs that are characteristic of bipolar disorder. In order to identify potential mechanisms, critical to designing optimal treatment strategies, this longitudinal study investigated (a) the degree to which disease outcome is correlated with functional outcome and direct treatment costs, and (b) whether similar demographic or clinical characteristics predict disease and functional outcome and healthcare costs. **METHODS:** Disease and functional outcome were assessed in bimonthly structured interviews over 48 weeks in 43 outpatient veterans with bipolar disorder. Direct mental health treatment costs from the VA perspective were determined from the VA database and patient interview. Regression analysis was used to determine association among the three outcome domains, and to identify clinical or demographic variables that predicted each of the three domains. **RESULTS:** Functional outcome was correlated with depressive, but not manic, symptoms during follow-up. Costs were not correlated with any measure of disease or functional outcome. Several demographic, but not clinical, characteristics predicted functional outcome. In contrast, several clinical, but not demographic, characteristics predicted symptom status. No predictors were associated with direct treatment costs. **LIMITATIONS:** Subjects were predominantly male veterans of relatively homogeneous social class, followed prospectively for approximately one year in a clinic designed specifically to minimize barriers to care. **CONCLUSIONS:** Data from this and prior studies indicate that ongoing depressive symptoms are strongly associated with functional outcome, although substantial variance remains unexplained. Optimal models to explain functional outcome and healthcare costs will need to address factors besides simply disease severity and chronicity. The authors present a heuristic paradigm for understanding both the research and therapeutic aspects of these findings.

Bauer, M. S., N. Shea, et al. (1997). "Predictors of service utilization in veterans with bipolar disorder: a prospective study." *Journal of Affective Disorders* 44: 159-168.

This study prospectively followed 103 bipolar patients enrolled in a VA treatment program for 1 year. Mental health service utilization was recorded and aggregated using the VA Cost Distribution Report. We hypothesized that previously reported predictors of disease severity would also predict service utilization, and that several other predictors of service utilization might also be identified.

Analyses indicated that only the presence of a major affective episode at clinic intake and a recalled history of childhood physical abuse predicted mental health service utilization. Contrary to expectations, previously reported predictors of disease severity were not significant predictors. Implications for the study of economic outcome are discussed. In particular, we propose that economic outcome is a complex function of both patient and system factors, rather than simply being passively driven by disease severity.

Bennett, C. L., J. R. Curtis, et al. (1996). "U.S. hospital care for HIV-infected persons and the role of public, private, and Veterans Administration hospitals." *J Acquir Immune Defic Syndr Hum Retrovirol* 13(5): 416-421.

Hospitals are a major provider of medical care for human immunodeficiency virus (HIV)-infected persons. Although utilization and patterns of care profiles in public and private hospitals have been evaluated for acquired immunodeficiency syndrome (AIDS)-

related *Pneumocystis carinii* pneumonia (PCP), one of the most costly and common severe complications of AIDS, information from Veterans Administration (VA) hospitals has not been reported previously. This article reports on inpatient care for PCP patients by obtaining data from VA, private, and public hospitals. Cost and resource utilization data were obtained from reviews of medical records, claims, and provider bills from 26 non-VA hospitals and 18 VA hospitals in 10 cities in the United States. Data on severity of illness, patterns of care, and outcomes for PCP were obtained from medical record reviews from 2,174 PCP cases treated in 82 non-VA and 14 VA hospitals in five U.S. cities. Estimates were made of the average costs and the rates of use of diagnostic tests, anti-PCP medications, and intensive care units for samples of public hospital, private hospital, and VA patients with PCP. With mean charges for a single PCP episode of \$14,500 to \$16,060, PCP remains one of the most costly complications of AIDS. Although the severity of PCP illness at admission was greatest at public hospitals, the intensity of care was lowest: for frequency of cytologic diagnosis (48% at public, 62% at VA, and 66% at private hospitals), bronchoscopy (45% at public, 60% at VA, and 66% at private hospitals), and intensive care unit use (11% at public, 22% at VA, and 19% at private hospitals). In-hospital mortality rates for PCP also differed in the three types of hospitals (20% at public, 24% at VA, and 18% at private hospitals). Patterns of PCP care differ among VA, public, and private hospitals. Future studies on the HIV epidemic should include data collected from uniform data sources from VA hospitals, in addition to public and private hospitals, to provide insight on the processes of care and outcomes for HIV-infected persons.

Bourdette, D. N., A. V. Prochazka, et al. (1993). "Health care costs of veterans with multiple sclerosis: implications for the rehabilitation of MS. VA Multiple Sclerosis Rehabilitation Study Group." *Arch Phys Med Rehabil* 74(1): 26-31.

We retrospectively determined health care costs among veterans with multiple sclerosis (MS) and correlated the costs with neurologic dysfunction. Total health care costs for the 165 patients averaged \$35,000/year. VA benefits and homecare together accounted for 85% of the total costs. Total health care costs correlated with two measures of neurologic dysfunction, the Expanded Disability Status Scale (EDSS) ( $r = 0.61$ ,  $p < 0.001$ ) and the Incapacity Status Scale (ISS) ( $r = 0.64$ ,  $p < 0.001$ ). The costs of VA benefits, homecare, and hospitalizations also correlated with the EDSS, ISS, and other measures of neurologic dysfunction whereas the cost of outpatient clinic visits did not. In a period of three years, there were 40 hospitalizations, at a total cost of \$412,800, that were potentially preventable with appropriate outpatient management. Improving selfcare and avoiding preventable hospitalizations might lower the considerable health care costs of MS.

Brown, M. and R. J. Luchi (1980). "A veterans Administration Hospital's EKG costs: comparison with those of military and community hospitals." *Military Medicine* 145(1): 26-29.

Campbell, C. R., K. N. Gillespie, et al. (1991). "The effects of residency training programs on the financial performance of Veterans Affairs medical centers." *Inquiry* 28(3): 288-299.

This study examines financial performance and physician productivity in Veterans Affairs teaching hospitals following the elimination of a separate payment for the indirect costs of medical education. Financial performance of teaching hospitals in the VA system was no worse than nonteaching peers even without a teaching subsidy. Residents were found to provide patient care but this contribution to output was offset by indirect teaching costs of resident training. Physicians were less productive in teaching hospitals, possibly reflecting the time spent in training and supervising residents, while nurses were more productive. Finally, as staff size increases, the indirect costs of medical education decrease. Future downsizing of residency programs would financially benefit smaller-staffed VAMCs; larger-staffed facilities would lose.

Carey, K. (2000). "A multilevel modelling approach to analysis of patient costs under managed care." *Health Economics* 9(5): 435-446.

The growth of the managed care model of health care delivery in the USA has led to broadened interest in the performance of health care providers. This paper uses multilevel modelling to analyse the effects of managed care penetration on patient level costs for a sample of 24 medical centres operated by the Veterans Health Administration (VHA). The appropriateness of a two level approach to this problem over ordinary least squares (OLS) is demonstrated. Results indicate a modicum of difference in institutions' performance after controlling for patient effects. Facilities more heavily penetrated by the managed care model may be more effective at controlling costs of their sicker patients.

Carey, K. and J. F. Burgess, Jr. (1999). "On measuring the hospital cost/quality trade-off." *Health-Economics* 8(6): 509-520.

This paper explores the relationship between cost and quality of hospital care. A total operating cost function is estimated for 137 US Department of Veterans Affairs hospitals for 1988-1993 using three rate-based measures of quality as regressors. The high likelihood of the existence of measurement error in quality in the cross section leads to the application of novel instrumental variable techniques. Results suggest that mortality and readmission indices are adjusted inadequately for illness severity. The measure on the failure to follow up inpatient discharges with outpatient care, however, appears to increase cost. The results of this paper underscore a number of practical difficulties and challenges facing government or other systems in evaluating the relative performance of their hospitals.

Chapko, M. K., J. L. Ehreth, et al. (1991). "Methods of determining the cost of health care in the Department of Veterans Affairs medical centers and other non-priced settings." *Evaluation and the Health Professions* 14(3): 282-303.

Cost is increasingly important in the evaluation of health care. Though charges are often used as a proxy for cost, some health care systems such as the Veterans Administration do little or no billing. This article describes, presents examples of, and evaluates four options for determining the cost of care within the Department of Veterans Affairs: measuring input costs, the Department's cost accounting system, the reimbursement system, and use of charges from a surrogate health care facility. Each approach is evaluated for accuracy, ability to compare the costs of different treatments, and effort required to estimate cost.

Chapko, M. K., J. L. Ehreth, et al. (1993). "Effects of adult day health care on utilization and cost of care for subgroups of patients." *Medical Care* 31(9 Suppl): SS62-SS74.

An important goal of the Adult Day Health Care (ADHC) Evaluation Study was to identify subgroups of patients assigned to ADHC for whom the health care costs were less than, or not higher than, the costs of similar patients assigned to customary care. Patients eligible for VA services because of a severe disability that occurred during military service had significantly lower costs when assigned to ADHC compared with customary care. For several types of patients, total health care costs were not significantly higher for those assigned to ADHC compared with those assigned to customary care: patients who at study intake 1) were at highest risk of going to a nursing home, 2) had high levels of physical dysfunction as measured by the Sickness Impact Profile, 3) had multiple behavior problems, and 4) were eligible for VA services because of a less severe service-connected disability but admitted to the ADHC for treatment of that disability. Two types of patients were found to have particularly high costs when assigned to ADHC compared with customary care: patients with low levels of physical dysfunction and patients with few behavior problems. Significant differences in the relative costs of ADHC versus customary care also were found between the 4 study sites.

Chapko, M. K., M. L. Rothman, et al. (1993). "Data collection in the Adult Day Health Care Evaluation Study." *Medical Care* 31(9 Suppl): SS15-SS25.

This report presents data collection measures and methods for the evaluation of Adult Day Health Care (ADHC) in the Department of Veterans Affairs (VA). Measures of patient health were survival, the Sickness Impact Profile, self-rated health, the Mini-Mental State Exam, Psychological Distress Scale, Social Support Scale, and Problem Behaviors Scale. Measures of health for the care giver were: Activities of Daily Living, Instrumental Activities of Daily Living, health perceptions, Psychological Distress Scale, life satisfaction, Social Support Scale, and Caregiver Burden Scale. We also assessed patient and care giver satisfaction with the care received by the patient. Measures of health status and outcomes were assessed primarily through patient and care giver interview at study enrollment, 6 months, and 12 months. Utilization and cost both within and outside VA were assessed for hospital, ambulatory care, nursing home, ADHC, home care, pharmacy, laboratory, and other forms of health care. Sources of utilization data included VA's computerized patient database, VA medical records, patient questionnaires, care giver questionnaires, and health care providers outside VA. Costs were obtained from VA's cost accounting system, VA Central Office, VA's contracts with outside providers, and directly from outside providers. Utilization and cost were assessed for each patient for a period of 1 year after entry into the study.

Chen, S., T. H. Wagner, et al. (2001). "The effect of reforms on spending for veterans' substance abuse treatment, 1993-1999." *Health Affairs (Millwood)* 20(4): 169-75.

Cohen, H. J., J. R. Feussner, et al. (2002). "A controlled trial of inpatient and outpatient geriatric evaluation and management." *New England Journal of Medicine* 346: 905-912.

**BACKGROUND:** Over the past 20 years, both inpatient units and outpatient clinics have developed programs for geriatric evaluation and management. However, the

effects of these interventions on survival and functional status remain uncertain.

**METHODS:** We conducted a randomized trial involving frail patients 65 years of age or older who were hospitalized at 11 Veterans Affairs medical centers. After their condition had been stabilized, patients were randomly assigned, according to a two-by-two factorial design, to receive either care in an inpatient geriatric unit or usual inpatient care, followed by either care at an outpatient geriatric clinic or usual outpatient care. The interventions involved teams that provided geriatric assessment and management according to Veterans Affairs standards and published guidelines. The primary outcomes were survival and health-related quality of life, measured with the use of the Medical Outcomes Study 36-Item Short-Form General Health Survey (SF-36), one year after randomization.

Secondary outcomes were the ability to perform activities of daily living, physical performance, utilization of health services, and costs. **RESULTS:** A total of 1388 patients were enrolled and followed. Neither the inpatient nor the outpatient intervention had a significant effect on mortality (21 percent at one year overall), nor were there any synergistic effects between the two interventions. At discharge, patients assigned to the inpatient geriatric units had significantly greater improvements in the scores for four of the eight SF-36 subscales, activities of daily living, and physical performance than did those assigned to usual inpatient care. At one year, patients assigned to the outpatient geriatric clinics had better scores on the SF-36 mental health subscale, even after adjustment for the score at discharge, than those assigned to usual outpatient care. Total costs at one year were similar for the intervention and usual-care groups.

**CONCLUSIONS:** In this controlled trial, care provided in inpatient geriatric units and outpatient geriatric clinics had no significant effects on survival. There were significant reductions in functional decline with inpatient geriatric evaluation and management and improvements in mental health with outpatient geriatric evaluation and management, with no increase in costs.

Cummings, J. E., S. L. Hughes, et al. (1990). "Cost-effectiveness of Veterans Administration hospital-based home care. A randomized clinical trial." *Archives of Internal Medicine* 150(6): 1274-1280.

A randomized design was used to examine the cost-effectiveness of a Veterans Administration hospital-based home care program that case managed inpatient and outpatient care. Patients (N = 419) with two or more functional impairments or a terminal illness were randomized to hospital-based home care (n = 211) or customary care (n = 208). Functional status, satisfaction with care, and morale were measured at baseline and at 1 and 6 months after discharge from the hospital; health care utilization was tracked for 6 months. Findings included significantly higher (0.1 on a three-point scale) patient and caregiver satisfaction with care at 1 month and lower Veterans Administration and private sector hospital costs (\$3000 vs \$4245) for the experimental group. Net per person health care costs were also 13% lower in the experimental group. We conclude that this model of hospital-based home care is cost-effective and that its expansion to cover these two patient groups throughout the Veterans Administration system can improve patient care at no additional cost.

De Nino, L. A., V. A. Lawrence, et al. (1997). "Preoperative spirometry and laparotomy: blowing away dollars." *Chest* 111(6): 1536-41.

**STUDY OBJECTIVE:** Increasing evidence indicates that routine preoperative diagnostic spirometry (pulmonary function tests [PFTs]) before elective abdominal surgery does not predict individual risk of postoperative pulmonary complications and is overutilized. This economic evaluation estimates potential savings from reduced use of preoperative PFTs. **DESIGN:** Analyses of (1) real costs (resource consumption to perform tests) and (2) reimbursements (expenditures for charges) by third-party payers. **SETTING:** University-affiliated public and Veterans Affairs hospitals. **PATIENTS:** Adults undergoing elective abdominal operations. **MEASUREMENTS AND RESULTS:** Average real cost of PFTs was \$19.07 (95% confidence interval [CI], \$18.53 to \$19.61), based on a time and motion study. Average reimbursement expenditure by third-party payers for PFTs was \$85 (range, \$33 to \$150; 95% CI, \$68 to \$103), based on Medicare payment of \$52 and a survey of nine urban US hospitals with a spectrum of bed sizes and teaching status. Estimates from published literature included the following: (1) annual number of major abdominal operations, 3.5 million; and (2) proportion of PFTs not meeting current guidelines, 39% (95% CI, 0.31 to 0.47). Local data were used when estimates were not available in the literature: (1) proportion of laparotomies that are elective, 76% (95% CI, 0.73 to 0.79); and (2) frequency of PFTs before laparotomy, 69% (95% CI, 0.54 to 0.84). Estimated annual national real costs for preoperative PFTs are \$25 million to \$45 million. If use of PFTs were reduced by our estimate for the proportion of PFTs not meeting current guidelines, potential annual national cost savings would be \$7,925,411 to \$21,406,707. National reimbursement expenditures by third-party payers range from more than \$90 million to more than \$235 million. If use were reduced, potential annual savings in reimbursements would be \$29,084,076 to \$111,345,440. Potential savings to Medicare approach \$8 million to \$20 million annually. **CONCLUSION:** Reduced use of PFTs before elective abdominal surgery could generate substantial savings. Current evidence indicates reduced use would not compromise patients' outcomes.

Ehreth, J., M. Chapko, et al. (1993). "Cost of VA adult day health care programs and their effect on utilization and cost of care." *Med Care* 31(9 Suppl): SS50-61.

The VA-ADHC Evaluation included a detailed assessment of the cost of the VA-ADHC programs and an evaluation of their effect on patients' utilization and costs of other health care services. Although each VA-ADHC program had little variation in its program costs over the 3 years of the study, there were large variations between the programs in total costs, their costs per patient day, and in some cost components. The 3 most important factors in determining the level of program costs were: the way patients were transported to and from ADHC, the availability of space to house the program, and the staff-to-patient ratio. The total cost of health care for patients randomly assigned to VA-ADHC was significantly (15.5%) higher than those assigned to customary care. Although ADHC care did substitute for certain other forms of care (i.e., home care and clinic visits), there was not enough of a substitution effect to offset the additional costs of ADHC services.

Ehreth, J. L. (1996). "The implications for information system design of how health care costs are determined." *Medical Care* 34(3 Suppl): MS69-MS82.

As the costs of health care assume increasing importance in national health policy, information systems will be required to supply better information about how costs are generated and how resources are distributed. Costs, as determined by accounting systems, often are inadequate for policy analysis because they represent resources consumed (expenditures) to produce given outputs but do not measure forgone alternative uses of the resources (opportunity costs). To accommodate cost studies at the program level and the system level, relational information systems must be developed that allow costs to be summed across individuals to determine an organization's costs, across providers to determine an individual patient's costs, and across both to determine system and population costs. Program level studies require that cost variables be grouped into variable costs that are tied to changes in volume of output and fixed costs that are allocated rationally. Data sources for program-level analyses are organizational financial statements, cost center accounting records, Medicare cost reports, American Hospital Association surveys, and the Department of Veterans Affairs (VA) cost distribution files. System-level studies are performed to predict future costs and to compare costs of alternative modes of treatment. System-level analyses aggregate all costs associated with individuals to produce population-based costs. Data sources for system-level analyses include insurance claims; Medicare files; hospital billing records; and VA inpatient, outpatient, and management databases. Future cost studies will require the assessment of costs from all providers, regardless of organizational membership status, for all individuals in defined populations.

Ehreth, J. L., M. Chapko, et al. (1993). "Comparison of utilization and cost among contract adult day health care, VA adult day health care, and customary care." *Medical Care* 31(9 Suppl): SS84-SS93.

The contract ADHC evaluation compared the utilization and costs of patients assigned to contract ADHC with patients assigned to VA-ADHC care or customary care in the VA-ADHC evaluation. The ADHC costs per patient day were lower on average in the contract sites than in the VA-ADHC sites, although they were similar to the costs at 2 of the 4 VA-ADHCs. The contract site patients received significantly more days of ADHC care, offsetting their lower cost per day. Contract site patients had significantly fewer VA clinic visits and VA nursing home admissions than did patients in the VA-ADHC or customary care groups. Patients at the contract sites also had significantly fewer days of nursing home care than did the customary care group patients. Propensity scores based on intake characteristics were used to adjust for initial differences between the patients in the 2 evaluations. After adjustments, the total cost of care for contract ADHC patients was found to be significantly higher than the cost for customary care patients, but no significant difference was found between contract ADHC patients and VA-ADHC patients.

Ehreth, J. L., M. K. Chapko, et al. (1993). "Financial management of posthospital care programs." *Health Care Management Review* 18(2): 67-76.

In this article the model estimates differences in utilization and subsequent costs of inpatient acute care, nursing home, and clinic visits as a result of patients using a posthospital care program. These estimates are compared to actual costs showing the

model's robustness. The model is developed to aid in both the evaluation and the management of hospital-based postdischarge programs.

Elixhauser, A., D. M. Reker, et al. (1990). "A comparison of in-house and regionalized computerized tomography scanning: clinical impact and cost." *Health Services Research* 25(1 Pt 2): 177-196.

Over a two-year interval, computerized tomography (CT) scans at an urban, 400-bed Department of Veterans Affairs medical center (VAMC) were obtained in three ways. First, an in-house low-efficiency machine was used. Then, scans were done at another area hospital, in effect duplicating some aspects of regionalizing services. Finally, a high-efficiency in-house machine was used. Clinical outcomes and costs of diagnosing 181 bronchogenic cancer patients were compared across the three time periods to identify any differences associated with regionalization of CT services. Patient groups were homogeneous with respect to sociodemographic characteristics, clinical presentation, and severity of disease. The first part of the analysis investigated whether the site of CT scanning affected clinical outcomes. Diagnostic procedures, surgical results, mortality, and length of stay were compared using one-way analysis of variance. Significant differences were found only for conventional tomography and CT utilization rates. While conventional tomography declined across the periods, CT utilization increased, exceeding national trends. The second part of the analysis examined the costs of CT scanning. During the regionalized period, the hospital paid a fixed fee of \$519 per scan. Estimated costs of in-house scans were \$285 in the low-efficiency and \$141 in the high-efficiency periods. Charge-based payments made to the external facility and differences in the volumes of patients scanned internally account for the cost differences. The analysis showed that while regionalized CT scanning did not compromise the quality of care for these VA patients, it was more costly. Results suggest that VA hospital administrators should carefully consider ownership and payment arrangements when comparing regionalized and in-house provision of services.

Engelhardt, J. B., R. W. Toseland, et al. (1996). "The effectiveness and efficiency of outpatient geriatric evaluation and management." *Journal of the American Geriatrics Society* 44(7): 847-856.

**OBJECTIVE:** To compare the effectiveness of geriatric evaluation and management (GEM) with usual primary care (UPC). **DESIGN:** A 2 x 3 randomized controlled group design. **SETTING:** A 450-bed Department of Veterans Affairs Medical Center (VAMC) that provides general medical and surgical care to eligible veterans. **PARTICIPANTS:** One-hundred sixty male subjects (mean age = 72 years), who were above average users of VAMC outpatient clinics and who had at least two Activity of Daily Living (ADL) or Instrumental Activity of Daily Living (IADL) impairments, were assigned to GEM (n = 80) or UPC (n = 80). **MEASUREMENTS:** Data were collected about patients' (1) health and functional status, (2) psychosocial well-being, (3) quality of health and social care, (4) health care utilization, and (5) health care costs. Data were obtained before randomization, and again at 8 and 16 months. **RESULTS:** The results indicated that GEM was more effective than UPC in improving some aspects of the quality of health and social care and in increasing patient satisfaction with care. GEM also reduced emergency room use, and showed a trend toward decreasing acute

admissions. It was not effective, however, in improving patients' psychosocial well-being. Except for a short-term survival advantage, it was also not effective in preventing deterioration in their health and functional status. Further, GEM did not reduce overall utilization of outpatient or inpatient services, and it significantly increased total outpatient health care costs. **CONCLUSIONS:** Outpatient GEM improves patient satisfaction and some aspects of the quality of care patients' receive but does not reduce the cost of outpatient or inpatient care. Longer-term follow-up studies are needed to determine whether reductions in emergency room use and inpatient admissions persist over time and result in reductions in the overall cost of care.

Fontana, A. and R. Rosenheck (1997). "Effectiveness and cost of the inpatient treatment of posttraumatic stress disorder: comparison of three models of treatment." *American Journal of Psychiatry* 154(6): 758-765.

**OBJECTIVE:** This study compared the outcomes and costs of three models of Department of Veterans Affairs (VA) inpatient treatment for posttraumatic stress disorder (PTSD): 1) long-stay specialized inpatient PTSD units, 2) short-stay specialized evaluation and brief-treatment PTSD units, and 3) nonspecialized general psychiatric units. **METHOD:** Data were drawn from 785 Vietnam veterans undergoing treatment at 10 programs across the country. The veterans were followed up at 4-month intervals for 1 year after discharge. Successful data collection averaged 66.1% across the three follow-up intervals. **RESULTS:** All models demonstrated improvement at the time of discharge, but during follow-up symptoms and social functioning rebounded toward admission levels, especially among participants who had been treated in long-stay PTSD units. Veterans in the short-stay PTSD units and in the general psychiatric units showed significantly more improvement during follow-up than veterans in the long-stay PTSD units. Greatest satisfaction with their programs was reported by veterans in the short-stay PTSD units. Finally, the long-stay PTSD units proved to be 82.4% and 53.5% more expensive over 1 year than the short-stay PTSD units and general psychiatric units, respectively. **CONCLUSIONS:** The paucity of evidence of sustained improvement from costly long-stay specialized inpatient PTSD programs and the indication of high satisfaction and sustained improvement in the far less costly short-stay specialized evaluation and brief-treatment PTSD programs suggest that systematic restructuring of VA inpatient PTSD treatment could result in delivery of effective services to larger numbers of veterans.

Fries, B. E., P. W. Durance, et al. (1993). "A comprehensive payment model for short- and long-stay psychiatric patients." *Health Care Financing Review* 15(2): 31-50.

In this article, a payment model is developed for a hospital system with both acute- and chronic-stay psychiatric patients. "Transition pricing" provides a balance between the incentives of an episode-based system and the necessity of per diem long-term payments. Payment is dependent on two new psychiatric resident classification systems for short- and long-term stays. Data on per diem cost of inpatient care, by day of stay, was computed from a sample of 2,968 patients from 100 psychiatric units in 51 Department of Veterans Affairs (VA) Medical Centers. Using a 9-month cohort of all VA psychiatric discharges nationwide (79,337 with non-chronic stays), profits and losses were simulated.

Fries, B. E., D. R. Nerenz, et al. (1990). "A classification system for long-staying psychiatric patients." *Medical Care* 28(4): 311-323.

Data on a sample of 890 Veteran's Administration long-staying psychiatric patients were studied to develop a classification system that explains actual daily resource use. Disturbed patients with lengths of stay of less than three years and those with psychotic conditions who are not withdrawn represent the two groups found to use significantly more resources in their daily care. The Long-Stay Psychiatric Patient Classification (LPPC) System, with six categories, explains 11.4% of the variability in per diem resource use and can be used for case-mix adjustment of payments for psychiatric care.

Fuller, M. A., K. M. Shermock, et al. (2002). "Service use and costs among VA patients with schizophrenia taking risperidone or olanzapine." *Psychiatric Services* 53(7): 855-860.

**OBJECTIVE:** The authors compared the changes in health care utilization and costs between a group of patients with schizophrenia who started treatment with risperidone and a group that started treatment with olanzapine. **METHODS:** A retrospective analysis was conducted of patients with schizophrenia who were given an initial prescription for risperidone or for olanzapine between March 1997 and March 1999. The change in utilization and cost of inpatient hospitalizations, outpatient clinic visits, medications, and total health care services from one year before to one year after initiation of treatment for the two groups was compared. **RESULTS:** The risperidone and olanzapine groups comprised 325 and 285 patients, respectively. Total health care costs declined by \$1,536 on average for patients in the risperidone group and increased by \$4,217 on average for patients in the olanzapine group after initiation of treatment. The difference was statistically significant, and it was largely due to drug and hospitalization costs. Drug costs for patients in the risperidone group underwent a smaller increase than those for patients in the olanzapine group (\$991 versus \$1,861). Hospitalization costs decreased by \$4,011 for patients in the risperidone group and increased by \$1,423 for those in the olanzapine group. **CONCLUSIONS:** Total health care costs declined for patients taking risperidone and increased for patients taking olanzapine after treatment was initiated.

Graham, N. A. (1986). *Comparative cost of inpatient hospital care: The Veterans Administration and the private sector*. Washington, D.C., Veterans Affairs Administration, Dept. of Medicine and Surgery.

Halpern, N. A., L. Bettes, et al. (1994). "Federal and nationwide intensive care units and healthcare costs: 1986-1992." *Critical Care Medicine* 22(12): 2001-2007.

**OBJECTIVES:** To establish Department of Veterans Affairs' intensive care unit (ICU) costs from a database and to use this information to validate the Russell equation, the most commonly used method of calculating ICU costs. To compare and trend Department of Veterans Affairs' and nationwide (USA) ICU and healthcare costs. **DESIGN:** Comparison study. **SETTING:** Database analysis of Department of Veterans Affairs' and nationwide ICUs over a 6-yr period (1986-1992), with biennial evaluations.

**MAIN MEASURES:** Costs and bed occupancies of Department of Veterans Affairs' and nationwide hospitals and ICUs, as well as United States national health expenditures and gross domestic product. **RESULTS:** Fifty percent to Department of Veterans Affairs' ICU funds were used for nurse and physician salaries. Department of Veterans Affairs' ICU direct and indirect cost ratios have remained constant (2:1). The Russell equation is valid, providing that the "inpatient only" cost variable is used. ICU costs were consistently lower in the Department of Veterans Affairs' than nationwide, as compared by the Russell equation. A smaller fraction of the hospital budget was allocated to the ICU in the Department of Veterans Affairs than in nationwide institutions. Despite an increasing nationwide ICU patient workload, the percentage of ICU fund allocations has not increased. Health care in the United States increases at a rate greater than the increase in gross domestic product. Healthcare delivery costs are increasing at a greater rate nationwide than in the Department of Veterans Affairs. The percentage increase in ICU cost per day, both in the Department of Veterans Affairs and nationwide, was less than the increase in healthcare costs. The percent of the gross domestic product, national health expenditure, and hospital cost used by the ICU has increased minimally during the course of this study. **CONCLUSIONS:** The Department of Veterans Affairs has the only national ICU line item cost database available. For the Russell equation calculation to be accurate, inpatient only costs should be used. Until customized Health Care Financing Administration analyses become available, nationwide ICU costs are best determined by the Russell equation. Department of Veterans Affairs' ICUs have a consistent cost advantage over nationwide ICUs. Increases in United States healthcare delivery costs continue to exceed the increase in gross domestic product. Cost containment is already occurring in critical care.

Hamilton, R. A. and T. Gordon (1992). "Incidence and cost of hospital admissions secondary to drug interactions involving theophylline." *Annals of Pharmacotherapy* 26(12): 1507-1511.

**OBJECTIVE:** To determine the incidence and cost of hospital admissions for theophylline toxicity, which occurred as a result of the concurrent use of one of the following medications: cimetidine, erythromycin, or ciprofloxacin. **DESIGN:** Retrospective chart review (18 months, between June 1989 and November 1990). **SETTING:** A Department of Veterans Affairs Medical Center. **PARTICIPANTS:** All patients who were receiving theophylline chronically (913 patients) and also had a prescription for cimetidine (124 patients with 140 treatment courses), erythromycin (66 patients with 93 treatment courses), or ciprofloxacin (39 patients with 59 treatment courses) dispensed. **INTERVENTIONS:** Each patient's medical record was reviewed to identify hospital admissions within 30 days following the dispensing of the interacting drug. **MAIN OUTCOME MEASURES:** Admissions were considered to be related to theophylline toxicity if appropriate signs and symptoms were present and the theophylline concentration was above 20 micrograms/mL or had increased significantly from the concentration obtained prior to introduction of the interacting drug. **RESULTS:** One patient who received cimetidine and one who received ciprofloxacin were admitted for theophylline toxicity (2 of 292 potential interactions, 0.81 percent). Admissions were for 16 and 13 days, respectively, and total costs for the two admissions were \$12,864.22 or \$44.00, respectively, per potential interaction. The entire admission was not for

theophylline toxicity; it appeared that iatrogenic factors contributed to the duration.

**CONCLUSIONS:** The incidence of hospital admissions secondary to theophylline drug interactions with cimetidine, ciprofloxacin, or erythromycin is low, but the admissions represent considerable expense, even when distributed among all patients at risk for the interactions.

Hedrick, S. C., M. L. Rothman, et al. (1993). "Summary and discussion of methods and results of the Adult Day Health Care Evaluation Study." *Medical Care* 31(9 Suppl): SS94-SS103.

This article summarizes the study results and presents an evaluative summary of the implementation of study methods designed to provide guidance in the degree of confidence with which the results may be accepted and generalized to other situations. Patients who were offered VA-ADHC services in the first phase of this study had significantly higher VA health care costs on average than patients assigned to customary care, with no apparent incremental health benefit to themselves or their care givers. One can have a high level of confidence in these results. The ADHC clinical services were implemented as planned, the randomized controlled trial was implemented successfully, and such threats to validity as insufficient numbers of patients and differential attrition were not present. Certain subgroups of patients assigned to VA-ADHC had VA costs of care that were not significantly higher than those assigned to customary care, although these results must be interpreted with caution. The findings of the second phase of the study evaluating contract ADHC provide no support for choosing to provide either contract ADHC or VA-ADHC over the other. The nonrandomized design and smaller sample size suggest that inferences from the contract ADHC evaluation should be drawn with more caution than those from the VA-ADHC evaluation.

Hedrick, S. C., M. L. Rothman, et al. (1991). "Adult day health care evaluation study: methodology and implementation. Adult Day Health Care Evaluation Development Group." *Health Services Research* 25(6): 935-960.

The Adult Day Health Care Evaluation Study was developed in response to a congressional mandate to study the medical efficacy and cost effectiveness of the Adult Day Health Care (ADHC) effort in the Department of Veterans Affairs (VA). Four sites providing ADHC in VA facilities are participating in an ongoing randomized controlled trial. Three years of developmental work prior to the study addressed methodological issues that were problematic in previous studies. This developmental work resulted in the methodological approaches described here: (1) a patient recruitment process that actively recruits and screens all potential candidates using empirically developed admission criteria based on predictors of nursing home placement in VA; (2) the selection and development of measures of medical efficacy that assess a wide range of patient and caregiver outcomes with sufficient sensitivity to detect small but clinically important changes; and (3) methods for detailed, accurate, and efficient measurement of utilization and costs of health care within and outside VA. These approaches may be helpful to other researchers and may advance the methodological sophistication of long-term care program evaluation.

Hughes, S. L., J. E. Cummings, et al. (1992). "A randomized trial of the cost effectiveness of VA hospital-based home care for the terminally ill." *Health Services Research* 26(6): 801-817.

All admissions to a 1,100-bed Department of Veterans Affairs (VA) hospital were screened to identify 171 terminally ill patients with informal caregivers who were then randomly assigned to VA hospital-based team home care (HBHC, N = 85) or customary care (N = 86). Patient functioning, and patient and caregiver morale and satisfaction with care were measured at baseline, one month, and six months. Health services utilization was monitored over the six-month study period and converted to cost. Findings included no differences in patient survival, activities of daily living (ADL), cognitive functioning, or morale, but a significant increase in patient ( $p = .02$ ) and caregiver ( $p = .005$ ) satisfaction with care at one month. A substitution effect of HBHC was seen. Those in the experimental group used 5.9 fewer VA hospital days ( $p = .03$ ), resulting in a \$1,639 or 47 percent per capita saving in VA hospital costs ( $p = .02$ ). As a result, total per capita health care costs, including HBHC, were \$769 or 18 percent (n.s.) lower in the HBHC sample, indicating that expansion of VA HBHC to serve terminally ill veterans would increase satisfaction with care at no additional cost.

Hughes, S. L., J. E. Cummings, et al. (1990). "A randomized trial of Veterans Administration home care for severely disabled veterans." *Medical Care* 28(2): 135-145.

This randomized study screened hospital admissions to all wards except Psychiatry and Spinal Cord Injured during a 3-year period to identify 233 severely disabled patients (2 impairments on the Katz Index of ADL) and caregivers who were willing to participate in a pretest-multiple posttest trial of the Hines VA Hospital-based Home Care (HBHC) Program. Patient functional status, morale, and satisfaction with care were measured at baseline, 1 month and 6 months post discharge. Caregiver satisfaction and morale were assessed at the same time periods. All health care services used by both groups were tracked over the 6-month period and converted to cost. Findings include improved 1-month satisfaction with care ( $P = 0.04$ ) and improved 6-month cognitive functioning ( $P = 0.04$ ) among HBHC patients and improved 1-month ( $P = 0.04$ ) and 6-month satisfaction with care ( $P$  less than 0.01) among their caregivers. A nonsignificant 10% decrease in net cost of care, was found in the treatment group, largely due to lower use of private sector hospital care.

Hughes, S. L., F. M. Weaver, et al. (2000). "Effectiveness of team-managed home-based primary care: a randomized multicenter trial." *JAMA* 284(22): 2877-2885.

CONTEXT: Although home-based health care has grown over the past decade, its effectiveness remains controversial. A prior trial of Veterans Affairs (VA) Team-Managed Home-Based Primary Care (TM/HBPC) found favorable outcomes, but the replicability of the model and generalizability of the findings are unknown.

OBJECTIVES: To assess the impact of TM/HBPC on functional status, health-related quality of life (HR-QoL), satisfaction with care, and cost of care. DESIGN AND SETTING: Multisite randomized controlled trial conducted from October 1994 to September 1998 in 16 VA medical centers with HBPC programs. PARTICIPANTS: A total of 1966 patients with a mean age of 70 years who had 2 or more activities of daily living impairments or a terminal illness, congestive heart failure (CHF), or chronic

obstructive pulmonary disease (COPD). Intervention Home-based primary care (n=981), including a primary care manager, 24-hour contact for patients, prior approval of hospital readmissions, and HBPC team participation in discharge planning, vs customary VA and private sector care (n=985). MAIN OUTCOME MEASURES: Patient functional status, patient and caregiver HR-QoL and satisfaction, caregiver burden, hospital readmissions, and costs over 12 months. RESULTS: Functional status as assessed by the Barthel Index did not differ for terminal ( $P=.40$ ) or nonterminal (those with severe disability or who had CHF or COPD) ( $P=.17$ ) patients by treatment group. Significant improvements were seen in terminal TM/HBPC patients in HR-QoL scales of emotional role function, social function, bodily pain, mental health, vitality, and general health. Team-Managed HBPC nonterminal patients had significant increases of 5 to 10 points in 5 of 6 satisfaction with care scales. The caregivers of terminal patients in the TM/HBPC group improved significantly in HR-QoL measures except for vitality and general health. Caregivers of nonterminal patients improved significantly in QoL measures and reported reduced caregiver burden ( $P=.008$ ). Team-Managed HBPC patients with severe disability experienced a 22% relative decrease (0.7 readmissions/patient for TM/HBPC group vs 0.9 readmissions/patient for control group) in hospital readmissions ( $P=.03$ ) at 6 months that was not sustained at 12 months. Total mean per person costs were 6.8% higher in the TM/HBPC group at 6 months (\$19190 vs \$17971) and 12.1% higher at 12 months (\$31401 vs \$28008). CONCLUSIONS: The TM/HBPC intervention improved most HR-QoL measures among terminally ill patients and satisfaction among non-terminally ill patients. It improved caregiver HR-QoL, satisfaction with care, and caregiver burden and reduced hospital readmissions at 6 months, but it did not substitute for other forms of care. The higher costs of TM/HBPC should be weighed against these benefits.

Hynes, D., D. Reda, et al. (1999). "Measuring costs in multisite randomized controlled trials: lessons from the VA Cooperative Studies Program." *Medical Care* 37(4 Suppl.): AS27-AS36.

OBJECTIVES: The interest in the economic impact of new health care interventions has increased dramatically over recent years; however, the results can be highly variable depending upon the economic assumptions made and the approaches taken in collecting the data and in conducting the analyses. This paper describes experiences from the VA Cooperative Studies Program in measuring health care utilization and costs for studies that evaluate clinical interventions. METHODS: Experiences from two multisite randomized clinical trials (RCTs) are highlighted to illustrate strategies used to measure costs by directly measuring health care utilization and economic data within the context of the trials. CONCLUSIONS: Despite the substantial resources required to gather evidence about the cost of care for health care innovations, future VA multisite studies should include accepted health economic approaches to make important contributions to health planning and health policy within and outside the VA health care system.

Jacobs, B. B. and L. M. Jacobs, Jr. (1992). "The effect of the new trauma DRGs on reimbursement." *J Trauma* 33(4): 495-502; discussion 502-3.

Reimbursement for trauma care based on prospective payment has not been satisfactory. The Health Care Financing Administration introduced four new Multiple

Significant Trauma (MST) DRGs in 1991 with the intention of covering patients who have had at least two body sites injured. To determine the effect if any on reimbursement, a sample of patients who were assigned the new DRGs over a 5-month period were analyzed. The analysis compared the calculated reimbursement for these 49 patients based on their total accumulated charges, DRG weights, and the average Medicare dollar blend along with the additional weight factor specific for the study facility. This analysis was compared with an additional analysis determining the reimbursement performed on the same patient sample but with DRG weights determined from DRGs derived from the 1989 DRG GROUPER/FINDER. During the 5-month study period, 5.5% of the patients discharged from the hospital has sustained at least one injury covered by ICD-9-CM codes. Of these, 49 (3.9%) were classified into one of the four new MST DRGs. The majority of patients were male (75.5%), the mean age was 31.8 years, and the total charges accumulated were \$1,809,192.23. The calculated DRG-based reimbursement was \$1,183,495.40, or 65.5% of the total charges. In the second part of the study, using the DRGs available in 1989 for the same sample of patients, the DRG-based reimbursement was \$691,437.72, or only 38.2% of the accumulated charges.(ABSTRACT TRUNCATED AT 250 WORDS)

Jubran, A., N. Gross, et al. (1993). "Comparative cost-effectiveness analysis of theophylline and ipratropium bromide in chronic obstructive pulmonary disease. A three-center study." *Chest* 103(3): 678-684.

The charts of 311 patients receiving theophylline (T) and 289 patients receiving ipratropium bromide (IB) for COPD were reviewed to determine the total costs and cost-effectiveness of these 2 agents in 3 different health-care settings. A direct cost-accounting method assessed cost, and a Markov decision-analysis model calculated cost-effectiveness. Costs to treat toxic effects were greater for T versus IB. The types and incidences of toxic effects, by drug, were similar among the three centers. Overall costs for T were \$121.40 per patient per therapy-month versus \$84.56 per patient per therapy-month for IB, as determined by the cost-accounting method. The marginal cost was \$366 for T over IB when extrapolated over 1 year using the Markov model. The Markov model also predicted that patients receiving IB had a greater number of complication-free therapy-months (measurement of effectiveness) than patients receiving T. We conclude that treatment with IB was less costly and more cost-effective than T.

Kashner, T. M. (1998). "Agreement between administrative files and written medical records: a case of the Department of Veterans Affairs." *Medical Care* 36(9): 1324-1336.

**OBJECTIVES:** This study examined the reliability of Department of Veterans Affairs' health information databases concerning patient demographics, use of care, and diagnoses. **METHODS:** The Department of Veterans Affairs' Patient Treatment files for Main, Bed-section (PTF) and Outpatient Care (OCF) were compared with medical charts and administrative records (MR) for a random national sample of 1,356 outpatient visits and 414 inpatient discharges to Department of Veterans Affairs' facilities between July 1 and September 30, 1995. Records were uniformly abstracted by a focus group of utilization review nurses and medical record coders blinded to administrative file entries. **RESULTS:** Reliability was adequate for demographics (kappa approximately 0.92), length of stay (agreement=98%), and selected diagnoses (kappa ranged 0.39 to 1.0).

Reliability was generally inadequate to identify the treating bedsection or clinic (kappa approximately 0.5). Compared with medical charts, Patient Treatment Files/Outpatient Care Files reported an additional diagnosis per discharge and 0.8 clinic stops per outpatient visit, resulting in higher estimates of disease prevalence (+39% heart disease, +19% diabetes) and outpatient costs (+36% per unique outpatient per quarter).

**CONCLUSIONS:** In the absence of pilot work validating key data elements, investigators are advised to construct health and utilization data from multiple sources. Further validation studies of administrative files should focus on the relation between process of data capture and data validity.

Kashner, T. M., D. E. Rodell, et al. (1992). "Outcomes and costs of two VA inpatient treatment programs for older alcoholic patients." *Hospital Community Psychiatry* 43(10): 985-989.

One hundred thirty-seven older alcoholic patients were randomly assigned to two different inpatient treatment programs at a Veterans Affairs medical center and followed for one year after discharge. The older alcoholic rehabilitation (OAR) program was operated by a tolerant staff that specialized in treating elderly alcoholics. Treatment included reminiscence therapy with goals of developing patient self-esteem and peer relationships. The traditional care program emphasized confrontation to focus on patients' past failures and present conflicts. Patient care costs were slightly lower (2.5 percent lower) in the OAR program than in the more traditional program, and OAR patients were 2.1 times more likely to report abstinence at one year. Response to the OAR program was best for patients over 60 years of age.

Keiser, P., M. B. Kvanli, et al. (1999). "Protease inhibitor-based therapy is associated with decreased HIV-related health care costs in men treated at a Veterans Administration hospital." *Journal of Acquired Immune Deficiency Syndromes* 20(1): 28-33.

**BACKGROUND:** Protease inhibitor (PI) therapy for HIV infection is associated with decreased rates of opportunistic infections and death. Statistical models predict that decreased complications will be associated with decreased hospitalization costs. A recent report suggested that the decrease in the HIV hospitalization costs were offset by increases in demand for outpatient services. We performed a study of hospital use and HIV-associated health care costs in our center to determine the following: whether PI therapy is associated with decreased inpatient use; whether PI therapy is associated with decreased outpatient use and costs; whether decreased HIV health care costs are associated with increased use of nucleoside analogues. **METHODS:** The Dallas Veteran Affairs Medical Center provides comprehensive inpatient and outpatient HIV care and thus can evaluate the relation between inpatient and outpatient costs. The mean monthly number of hospital days, Infectious Diseases clinic visits, emergency department visits, other outpatient clinic visits, inpatient costs, outpatient costs, and PI costs were determined from January 1, 1995 through July 31, 1997. This time period was then divided into three intervals. Comparisons of PI use and HIV-related health care costs were during the three intervals was performed using analysis of variance (ANOVA). Significant differences between the baseline characteristics were further analyzed through multiple linear regression. **RESULTS:** A decrease in hospital days, and all outpatient visits including emergency visits, and HIV clinic visits was determined. No difference

was found in the rate of use of other outpatient services. The per patient costs of HIV care decreased from a monthly average of \$1905 U.S. in the first interval to \$1122 U.S. in the last interval ( $p < .01$ ). Linear regression demonstrated an inverse relation between PI use and total HIV costs ( $B = -0.67$ ,  $p = .00$ , adjusted  $R^2 = 0.52$ ) but no relation between nucleoside use, stage of disease or financial class. CONCLUSIONS: PI therapy is associated with decreased hospital days and use of outpatient services. Total patient costs decreased, but a concomitant rise in outpatient costs took place. This increase was primarily a result of increased costs of acquiring PI. Increases in the number of nucleoside agents prescribed were not associated with decreased costs.

Keiser, P., N. Nassar, et al. (2001). "Long-term impact of highly active antiretroviral therapy on HIV-related health care costs." *Journal of Acquired Immune Deficiency Syndromes* 27(1): 14-19.

CONTEXT: Highly active antiretroviral therapy (HAART) is associated with decreased opportunistic infections, hospitalization, and HIV-related health care costs over relatively short periods of time. We have previously demonstrated that decreases in total HIV cost are proportional to penetration of protease inhibitor therapy in our clinic. OBJECTIVE: To determine the effects of HAART on HIV health care use and costs over 44 months. SETTING: A comprehensive HIV service within a Veterans Affairs Medical Center. DESIGN: A cost-effectiveness analysis of HAART. MAIN OUTCOME MEASUREMENTS: The mean monthly number of hospital days, infectious diseases clinic visits, emergency room visits, non-HIV-related outpatient visits, inpatient costs, and antiretroviral treatment costs per patient were determined by dividing these during the period from January 1995 through June 1998 into four intervals. Viral load tests were available from October 1996. Cost-effectiveness of HAART was evaluated by determining the costs of achieving an undetectable viral load over time. RESULTS: Mean monthly hospitalization and associated inpatient costs decreased and remained low 2 years after the introduction of protease inhibitors (37 hospital days per 100 patients). Total cost decreased from \$1905 per patient per month during the first quarter to \$1090 per patient per month in the third quarter but increased to \$1391 per patient per month in the fourth quarter. Antiretroviral treatment costs increased throughout the entire observation period from \$79 per patient per month to \$518 per patient per month. Hospitalization costs decreased from \$1275 per patient per month in the first quarter to less than \$500 per patient per month in each of the third and fourth quarters. The percentage of patients with a viral load  $< 500$  copies/mL increased from 21% in October 1996 to 47% in June of 1997 ( $p = .014$ ). The cost of achieving an undetectable viral load decreased from \$4438 per patient per month to \$2669 per patient per month, but this trend did not reach statistical significance ( $p = .18$ ). CONCLUSIONS: After an initial decrease, there was an increase in the total monthly cost of caring for HIV patients. Cost increases were primarily due to antiretroviral treatment costs, but these costs were offset by a marked decrease in inpatient-related costs. Increases in costs were not related to antiretroviral treatment failures as measured by the proportion of patients with low or undetectable viral loads. The cost of achieving an undetectable viral load remained stable despite increases in the cost of procuring antiretroviral agents.

Kessler, D. K., K. M. Kessler, et al. (1995). "Ambulatory electrocardiography: a cost per management decision analysis." *Archives of Internal Medicine* 155(2): 165-169.

**BACKGROUND:** This study evaluated the current clinical use and costs of ambulatory electrocardiographic (AECG) monitoring for arrhythmia detection based on a cost per management decision analysis. **METHODS:** Consecutive inpatient and outpatient 24-hour AECGs (n = 650) performed during the calendar year 1991 were retrospectively reviewed for clinical indication, arrhythmia detection, diary information, and whether a management decision that might alter patient outcome was derived from the data. The cost per management decision (based on a representative reimbursement of \$550 per AECG) and the cost index (CI) (all tests divided by useful tests) were calculated. **RESULTS:** Although arrhythmias were identified in 91% of the patients, management decisions were indicated in only 18% (cost per decision, \$2974; CI = 5.4). Management decisions were most often derived from the data in patients being evaluated for arrhythmia therapy (37 of 37 patients; cost per decision, \$550; CI = 1). Symptoms and arrhythmias were correlated in only 11 patients (2%). More often typical clinical symptoms were present (26 patients) in the absence of an arrhythmia. Of 101 AECGs following a cerebrovascular event, four had unsuspected atrial fibrillation (cost per decision, \$13,888; CI = 25.0). Dizziness or lightheadedness associated with other cardiac symptoms was more likely to lead to a management decision than the same symptoms in isolation (29% vs 7%;  $P < .05$ ). No patient had central nervous system symptoms correlated with an arrhythmia during the recording period or unsuspected ventricular tachycardia. **CONCLUSION:** Ambulatory electrocardiography has a highly variable and indication-dependent effectiveness and cost. The results suggest a strategy for improving the use of AECG based on knowing what testing indications are more likely to lead to useful clinical information.

Kominski, G., R. Andersen, et al. (2001). "UPBEAT: the impact of a psychogeriatric intervention in VA medical centers. Unified Psychogeriatric Biopsychosocial Evaluation and Treatment." *Medical Care* 39(5): 500-512.

**BACKGROUND:** The Unified Psychogeriatric Biopsychosocial Evaluation and Treatment (UPBEAT) program provides individualized interdisciplinary mental health treatment and care coordination to elderly veterans whose comorbid depression, anxiety, or alcohol abuse may result in overuse of inpatient services and underuse of outpatient services. **OBJECTIVES:** To determine whether proactive screening of hospitalized patients can identify unrecognized comorbid psychiatric conditions and whether comprehensive assessment and psychogeriatric intervention can improve care while reducing inpatient use. **DESIGN:** Randomized trial. **SUBJECTS:** Veterans aged 60 and older hospitalized for nonpsychiatric medical or surgical treatment in 9 VA sites (UPBEAT, 814; usual care, 873). **MEASURES:** The Mental Health Inventory (MHI) anxiety and depression subscales, the Alcohol Use Disorder Identification Test (AUDIT) scores, RAND 36-Item Health Survey Short Form (SF-36), inpatient days and costs, ambulatory care clinic stops and costs, and mortality and readmission rates. **RESULTS:** Mental health and general health status scores improved equally from baseline to 12-month follow-up in both groups. UPBEAT increased outpatient costs by \$1,171 ( $P < 0.001$ ) per patient, but lowered inpatient costs by \$3,027 ( $P = 0.017$ ), for an overall savings of \$1,856 ( $P = 0.156$ ). Inpatient savings were attributable to fewer bed days of

care (3.30 days;  $P = 0.016$ ) rather than fewer admissions. Patients with 1 or more pre-enrollment and postenrollment hospitalizations had the greatest overall savings (\$6,015;  $P = 0.069$ ). CONCLUSIONS: UPBEAT appears to accelerate the transition from inpatient to outpatient care for acute nonpsychiatric admissions. Care coordination and increased access to ambulatory psychiatric services produces similar improvement in mental health and general health status as usual care.

Koop, G. and K. Carey (1994). "Using seminonparametric methods to model hospital cost functions: The multi-product asymptotically ideal model." *Journal of Productivity Analysis* 5(2): 141-159.

The article develops a multi-product extension of the asymptotically ideal model which has several advantages over traditional cost functions. The AIM cost function has greater flexibility and allows for economic theory to be imposed via parametric restrictions alone. In addition, the AIM cost function is superior to other seminonparametric approaches as it is unlikely to suffer from overfitting problems. The multi-product AIM cost function is estimated using hospital data from 137 VA hospitals.

Kukull, W. A., T. D. Koepsell, et al. (1986). "Rapid estimation of hospitalization charges from a brief medical record review: evaluation of a multivariate prediction model." *Medical Care* 24(10): 961-966.

In settings where an itemized hospital bill is not generated, estimation of hospitalization charges for research or administrative purposes can be a laborious task. This article examines the extent to which the number of hospital days spent outside an intensive care unit (ICU), number of days in an ICU, number of laboratory tests performed, number of x-rays, and number of surgeries can be used in a multiple regression equation to impute inpatient charges for a sample of 103 hospitalizations at a Veterans Administration hospital. These predictor variables, all of which are readily ascertained in a brief medical record review, accounted for about 97% of the variance in imputed hospital charges. The bootstrap method was applied for validation of the prediction equation. Application of the method described here may be of value to researchers concerned with hospital charge estimation in non-fee-for-service settings.

Lambert, M. (1995). "Psychiatric crisis intervention in the general emergency service of a Veterans Affairs hospital." *Psychiatric Services* 46(3): 283-284.

An after-hours crisis intervention program staffed by psychiatric residents between 5 p.m. and 11:30 p.m. on weekdays was developed in the general emergency room at a Veterans Affairs hospital to reduce inpatient psychiatric admissions. The program offered medication, family interventions, and referrals to outpatient services. In the program's first year, inpatient admissions during the hours covered by the program decreased by 34 percent, for a net savings of nearly \$400,000 in inpatient treatment costs.

Law, A. V., D. S. Pathak, et al. (1995). "Cost-effectiveness analyses of the conversion of patients with non-insulin-dependent diabetes mellitus from glipizide to glyburide and of the accompanying pharmacy follow-up clinic." *Clinical Therapeutics* 17(5): 977-87.

At the Department of Veteran's Affairs Outpatient Clinic in Columbus, Ohio, patients with non-insulin-dependent diabetes mellitus who were receiving glipizide

therapy were converted to glyburide therapy over a 6-month period starting in mid-1993. A pharmacy follow-up clinic was instituted to help patients with problems associated with the transition. The conversion was intended to reduce costs by converting from a more expensive to a less expensive drug (in terms of acquisition cost) within the same therapeutic class. An initial analysis of the conversion indicated a savings of \$65,000.00 to the Department of Veterans' Affairs (VA) based on the drug acquisition cost differential alone. The purpose of our study was to retrospectively evaluate the cost-effectiveness of the conversion and pharmacy follow-up clinic from the perspective of the VA pharmacy department. Relevant costs and effectiveness (percentage of patients who achieved good glycemic control) were examined for three groups: group I--patients who were treated with glipizide, group II--patients who were treated with glipizide; group II--patients who were switched from glipizide to glyburide, accompanied by a pharmacy follow-up clinic; and group III--patients who were switched from glipizide to glyburide, with no follow-up clinic. Overall, group II had the lowest costs, and group II had to be the most effective. Cost-II effectiveness analysis indicated that, in general, the conversion from glipizide to glyburide was cost-effective. Incremental analysis performed for the follow-up group over the no follow-up group showed that for every 1% of patients who achieved good glycemic control, the VA would spend \$1.01 more for the follow-up groups. This was considered to be cost-effective for the VA.

Lehner, L. A. and J. F. Burgess, Jr. (1995). "Teaching and hospital production: the use of regression estimates." *Health Economics* 4(2): 113-125.

Medicare's Prospective Payment System pays U.S. teaching hospitals for the indirect costs of medical education based on a regression coefficient in a cost function. In regression studies using health care data, it is common for explanatory variables to be measured imperfectly, yet the potential for measurement error is often ignored. In this paper, U.S. Department of Veterans Affairs data is used to examine issues of health care production estimation and the use of regression estimates like the teaching adjustment factor. The findings show that measurement error and persistent multicollinearity confound attempts to have a large degree of confidence in the precise magnitude of parameter estimates.

Leslie, D. L., R. Rosenheck, et al. (2000). "Capitated payments for mental health patients: a comparison of potential approaches in a public sector population." *Journal of Mental Health Policy and Economics* 3: 35-44.

**BACKGROUND:** Both private and public health care systems have embraced capitated reimbursement as a method of controlling costs. **AIMS OF THE STUDY:** This study explores the financial implications of using reimbursement models based on clinically based patient classification schemes to distribute funds for the treatment of mental health patients in the Department of Veterans Affairs (VA). **METHODS:** We identified 53700 veterans treated in VA specialty mental health outpatient clinics during the first 2 weeks of fiscal year (FY) 1991 for whom relevant clinical data were available. We calculated total utilization and costs for this sample during the remainder of FY 1991 using VA administrative databases and simulated hypothetical distributions of funds based on seven alternative capitation models. The resulting distributions of funds across service networks and facility types were compared to actual expenditures. **RESULTS:**

Approximately 8% of overall VA budget was redistributed under a simple capitated scheme, and some individual networks and facility types experienced changes in funding of over 30%. Models based on clinical data resulted in only minor differences from average-cost reimbursement. Substantial variation in practice style was observed across Veterans Integrated Service Networks (VISNs), which was significantly associated with funding shifts under capitation. DISCUSSION: A simple capitated payment scheme would result in large changes in funding for some VISNs. Adjustments for case mix did not substantially affect patterns of redistribution. Patterns of redistribution appear to reflect large differences in practice style across VISNs. Although a capitated system will create incentives to reduce such variation, the effect of such shifts on patient well-being is unknown. IMPLICATIONS FOR HEALTH POLICIES: Any capitated system will create incentives to provide a uniform standard of care. In our analyses, the capitation rate was based on the average cost per treated patient in each category; however rates could be set higher or lower as policy makers deem necessary. The standard of care associated with the average cost is not necessarily the "correct" level of care. IMPLICATIONS FOR FURTHER RESEARCH: Our analyses explore the implications of capitated systems for mental health patients in the absence of behavioral change. Further research is needed to determine how providers actually respond to the different incentives created by capitation and what impact these changes have on patient well-being.

Lindberg, K. G., J. C. Sylvester, et al. (1992). "The costing out of operational expenses between the Veterans Administration and the Air Force at the New Mexico Regional Federal Medical Center." *Military Medicine* 157(11): 569-573.

The purpose of this pilot study was to identify the cost of providing care to Veterans Administration (VA) and Department of Defense (DOD) patients eligible for care in the Emergency Department of the New Mexico Regional Federal Medical Center in Albuquerque, New Mexico. Medical records for the Emergency Department (N = 456) were reviewed for individual medical supply item and medication usage. Cost data were then tabulated for each item and each group, respectively. The results indicated that the DOD and VA shared equally in the consumption of expendable medical supply and medication funds in the Emergency Department.

Maciejewski, M. L., M. K. Chapko, et al. (2002). "VA community-based outpatient clinics: cost performance measures." *Medical Care* 40(7): 587-595.

OBJECTIVE: To examine the direct costs of treating veterans in Community-Based Outpatient Clinics (CBOC) and primary care clinics operated by VA medical centers (VAMCs) between April 1998 and September 1998. RESEARCH DESIGN: In a retrospective observational study of patients in eighteen CBOCs and fourteen VAMCs, direct costs were compared. In addition, the costs of treating patients in new and established CBOCs were also examined. MEASURES: The three types of costs examined include direct cost per primary care visit, direct primary care cost per patient, and total direct cost per patient in ordinary least squares regressions with facility-specific random effects. Indirect costs for overhead and administration were excluded. All cost comparisons controlled for patient characteristics and case-mix differences via the Diagnostic Cost Group methodology. RESULTS: Results indicate that CBOC patients

and VAMC patients had similar direct primary care costs on a per visit and per patient basis. Total direct costs for CBOC patients were lower compared with VAMC patients, because of lower specialty and ancillary care costs. Patients in new CBOCs had similar primary, specialty, ancillary and inpatient care costs when compared with patients in established CBOCs. CONCLUSION: Lower total costs for CBOC patients may be a consequence of substituting primary care at CBOCs for expensive specialty and ancillary care at VAMCs. CBOCs may be an alternative approach to providing care to veterans at a lower cost than traditional delivery models based in VA Medical Centers.

Menke, T. J., R. H. Homan, et al. (1999). "Determining costs in VA: research design problems and solutions illustrated with case studies." *Medical Care* 37(4 Suppl.): AS18-AS26.

BACKGROUND: Department of Veterans Affairs (VA) administrative cost data bases contain inaccuracies and do not provide patient-level data. OBJECTIVE: To describe methods of VA cost determination that are appropriate for specific types of studies and to exemplify these methods with case studies. RESEARCH DESIGN: VA utilization and cost data sources are described, and their limitations highlighted. Strategies for determining costs are discussed for health care that is critical to the study, for other types of health care, and for new programs or interventions. Three case studies are presented to illustrate cost-finding methods. RESULTS: A hybrid approach to determining VA costs is discussed. For health care that is critical to the study, administrative data can be replaced or supplemented with primary data, information from the fiscal or other services, or non-VA data. Primary data are also needed to evaluate new programs or interventions. Less intensive data gathering methods can be used for health care that is not central to the study. The first case study illustrates cost determination for a randomized controlled trial, using an example of alternative ways of maintaining hemodialysis access graft patency. The second case study illustrates the determination of costs for all outpatient procedures to use in billing for veterans with private health insurance. The third case study describes the estimation of cost savings from regionalizing open heart surgery. CONCLUSIONS: Despite problems with VA administrative cost data, accurate VA costs can be determined.

Menke, T. J. and N. P. Wray (1999). "Use of a cost accounting system to evaluate costs of a VA special program." *Medical Care* 37(4 Suppl.): AS45-AS53.

BACKGROUND: The Department of Veterans Affairs (VA) established six mobile clinics to provide care for rural veterans. Each was operated by a parent VA Medical Center (VAMC). OBJECTIVE: To describe the use of a cost-accounting system which does not provide costs at the service or patient level to determine the costs of the mobile clinics. RESEARCH DESIGN: Costs per visit were compared among the mobile clinics with the parent VAMCs and with simulated fixed-location clinics. Cost data came from VA's Centralized Accounting for Local Management (CALM) data. Utilization data came from VA's outpatient file. RESULTS: Information was obtained from the VAMCs' fiscal services to reallocate costs among the CALM subaccounts to generate cost data that was comparable among the mobile clinics. Costs per visit for the mobile clinics were twice as high as those of the parent VAMCs. Costs per visit would be lower at fixed-location clinics unless the volume were substantially less than that provided by the

mobile clinics. CONCLUSION: Differences between cost allocations for accounting purposes and research are likely to necessitate adjusting cost accounting data for research purposes. Fortunately, information from the accountants or primary data can lead to a cost database which is appropriate for research evaluations. In the mobile clinics study, the analysis of cost accounting data led to the conclusion that mobile clinics were not a cost-effective way in which to provide care to rural veterans.

Menke, T. J. and N. P. Wray (1999). "Cost implications of regionalizing open heart surgery units." *Inquiry* 36(1): 57-67.

This study calculated the potential change in costs from regionalizing open heart surgery units in a geographic network of the Department of Veterans Affairs (VA). It used data from the VA's cost accounting system, and the authors conducted a sensitivity analysis. Under consolidation, savings from closing an open heart surgery unit would be partially offset by the costs of treating nonemergency cases at other VAs, treating emergency cases at non-VA hospitals, and transporting patients to regionalized facilities. Nevertheless, the potential savings from consolidation would exceed \$3 million, or 18% of the network's costs of treating open heart surgery patients.

Mole, L., K. Ockrim, et al. (1999). "Decreased medical expenditures for care of HIV-seropositive patients: The impact of highly active antiretroviral therapy at a US Veterans Affairs Medical Center." *Pharmacoeconomics* 16(3): 307-315.

Nettleman, M. D., M. Fredrickson, et al. (1994). "Tuberculosis control strategies: the cost of particulate respirators [see comments]." *Annals of Internal Medicine* 121(1): 37-40.

OBJECTIVE: To assess the cost of the mandatory use of high-efficiency particulate respirators to treat patients with known or suspected tuberculosis. DESIGN: A questionnaire was used to determine the number of high-efficiency particulate respirators required and the number of cases of tuberculosis in employees that could potentially be prevented. Indirect costs included the training and fitness testing of employees. The clinical efficacy of respirators is not known. To provide a best-case scenario, it was assumed that the respirators could prevent as many as 25% of tuberculosis cases in health care workers. SETTING: 159 acute care facilities administered by the Department of Veterans Affairs. PARTICIPANTS: Quality improvement, infection control, and employee health specialists. MEASUREMENTS: Cost of the respirators compared with their maximum predicted efficacy. RESULTS: The use of the respirators would cost \$7 million per case of tuberculosis prevented and \$100 million per life saved. CONCLUSIONS: High-efficiency particulate respirators are a costly means of trying to prevent tuberculosis. Costs could be reduced by reusing masks or by restricting the number of health care workers allowed to have contact with potentially infectious patients. As the health care budget undergoes further restrictions, specific means of accommodating the cost of new regulations must be found.

Nyman, J. A., M. S. Martinson, et al. (2002). "Cost-effectiveness of gemfibrozil for coronary heart disease patients with low levels of high-density lipoprotein cholesterol: the Department of Veterans Affairs High-Density Lipoprotein Cholesterol Intervention Trial." *Archives of Internal Medicine* 162(2): 177-182.

**BACKGROUND:** Although numerous clinical trials and economic analyses have established the efficacy and cost-effectiveness of lowering cholesterol for the prevention of coronary heart disease, there are few data on the role of raising high-density lipoprotein cholesterol (HDL-C) levels and lowering triglyceride levels. The US Department of Veterans Affairs (VA) Cooperative Studies Program HDL-C Intervention Trial (VA-HIT) was a multicenter, randomized trial of gemfibrozil, an agent that raised HDL-C levels and lowered triglyceride levels, yet had no effect on low-density lipoprotein cholesterol (LDL-C) levels. The study showed that gemfibrozil therapy significantly reduced major cardiovascular events (cardiovascular death, myocardial infarction, and stroke) in patients with coronary heart disease, low HDL-C levels, and low LDL-C levels. **OBJECTIVE:** To report the results of a cost-effectiveness study based on the results of the VA-HIT. **METHODS:** The cost per year of life gained with gemfibrozil therapy was calculated. Hazard functions were estimated, and the resulting probabilities were used in a Markov model simulation to estimate the effect of gemfibrozil on life expectancy and costs over a simulated lifetime. Sensitivity analyses were used to account for uncertainty. **RESULTS:** Using the prices of gemfibrozil that were negotiated by the VA, gemfibrozil was cost saving. Using drug prices found outside the VA, a quality-adjusted life-year saved by gemfibrozil therapy cost between \$6300 and \$17 100. **CONCLUSIONS:** Gemfibrozil reduces major cardiovascular events in male coronary heart disease patients with low levels of HDL-C and low levels of LDL-C and would result in cost saving at annual drug costs of \$100 or less in 1998 dollars. Even at the higher drug prices represented by the average wholesale price in the United States, the cost of a life-year saved is well below the threshold that would be deemed cost-effective. To our knowledge, this is the first economic analysis based on clinical trial data to assess the cost-effectiveness of raising HDL-C levels and lowering triglyceride levels in a setting in which LDL-C levels were not lowered.

Oboler, S. K., M. A. Blieden, et al. (1983). "A mobile internal medicine clinic." *Archives of Internal Medicine* 143(1): 97-99.

The Denver Veterans Administration Medical Center (DVAMC) established a mobile internal medicine clinic (MediVAn) to provide access to primary care for veterans living more than fifty miles from the center and to study the costs of such an outreach program. A fully equipped van staffed by an internist visited four Colorado cities weekly for scheduled appointments. In the first two years of operation there were 4,655 visits by 766 veterans with a mean age of 56 years, with 3.9 diagnoses, and receiving 3.0 medicines. The cost per MediVAn visit was \$68, compared with \$67 per outpatient visit at DVAMC. We conclude that a mobile medical clinic is a convenient method of delivering primary care over distances and is comparable in cost to outpatient hospital visits.

O'Connor, W. (1977). *Cost comparison of the veterans administration and community medical systems for episodes of acute inpatient medical and surgical care*. Washington, D.C., Veterans Affairs Administration, Dept. of Medical and Surgical Care.

Pankratz, L. and J. Jackson (1994). "Habitually wandering patients." *New England Journal of Medicine* 331(26): 1752-1755.

**BACKGROUND.** Physicians are sometimes confronted with patients who gain admission to one hospital after another, sometimes referred to as "wandering patients." Little is known about the presenting symptoms of these patients, their use of hospital resources, or the costs of their medical care. We analyzed the demographic and clinical characteristics of wandering patients served by Department of Veterans Affairs medical centers (VAMCs). **METHODS.** For each patient they admit, all 159 hospitals in the Veterans Affairs medical system submit demographic and diagnostic information to a central data base at the Data Processing Center in Austin, Texas. We searched these records to identify patients who were admitted to four or more VAMCs within each year from fiscal year 1988 through 1992. Patients so identified in any one year were called "wanderers"; those identified in all five years were designated "habitual wanderers." **RESULTS.** We identified 1013 wanderers in 1988. The number gradually declined each year to 729 in 1993. In 1991 there were 810 wandering patients, who averaged about eight admissions per year and over 100 days of inpatient care; they accounted for about \$26.5 million in costs for inpatient and outpatient care in that year. Only 35 patients wandered in all five years from 1988 through 1992. The most common discharge diagnoses of these 35 men were related to substance abuse (mostly alcoholism) and mental disorders. Their 2268 admissions and 7832 outpatient visits cost an estimated \$6.5 million over the five-year period. **CONCLUSIONS.** Patients who are repeatedly admitted to different hospitals--wandering patients--accumulate high numbers of admissions, cause diagnostic confusion, and receive uncoordinated care. Because of the complexity of their disorders, such patients require case management on a regional or national basis.

Peak, T., R. W. Toseland, et al. (1995). "The impact of a spouse-caregiver support group on care recipient health care costs." *Journal of Aging and Health* 7(3): 427-449.

Frail elderly veterans who received care at a Department of Veterans Affairs medical center and whose spouse-caregivers participated in support groups to which they had been randomly assigned had lower health care costs over a 1-year period than did control participants. The greatest impact was observed for participants perceived by their spouse-caregivers to be in the poorest health. What is important to consider about this result in terms of health care policymaking is that support groups targeted for spouse-caregivers of elderly veterans in poor health produced significant outpatient, inpatient, and total cost savings for the care recipients, and were cost effective.

Perez, E. D. (1992). "Regional variation in VAMC's operative efficiency." *J Med Syst* 16(5): 207-13.

The Department of Veterans Affairs is managed by a global budget regulated by Congress. How effective the VA handles this budget can provide insight into future plans for any form of universal health insurance. Using Data Envelope Analysis (DEA) this study shows that 51 of 158 continental VAMCs operate relatively efficiently. Variation in operative efficiency could be explained by Service Area size and geographic regional location. This finding suggests more active regional planning may improve veteran hospital operative efficiency.

Prashker, M. J., J. J. Anderson, et al. (1996). Nursing home cost study: A comparison of VA nursing homes and contract nursing homes. Boston, MA, U.S. Dept. of Veterans Affairs, Management Decision and Research Center.

Raisch, D. W., L. M. Klaurens, et al. (2001). "Impact of a formulary change in proton pump inhibitors on health care costs and patients' symptoms." *Digestive Diseases and Sciences* 46(7): 1533-1539.

Patients may fail to successfully undergo a switch in therapy associated with a formulary change. The aim of this study was to measure health care costs and outcomes among patients who failed a formulary change in proton pump inhibitors in a VA medical center. Patients who failed a switch from omeprazole to lansoprazole (N = 51) were matched with patients who were successfully switched (N = 51). Health care utilization data was gathered from VA electronic databases and medical records for six months before and after the switch and, for failure patients, during the lansoprazole trial period. Statistical comparisons between failure and success patients were performed on changes in health care costs between these time periods. Health outcome data for the lansoprazole trial period and subsequent omeprazole reinstatement period were obtained through a telephone questionnaire of failure patients. Changes in total health care utilization costs did not differ significantly between failure and success groups for any of the time periods. Failure patients had significantly poorer health outcomes during their lansoprazole trial periods with significantly greater severity of heartburn and severity and frequency of acid regurgitation ( $P < 0.001$ ). In conclusion, the formulary change had a negative impact upon health outcomes among failure patients but did not significantly affect their health care utilization costs. Identification of failure patients early in their lansoprazole trial periods could improved their health outcomes and satisfaction with medical care.

Reilly, P. C., Jr. and M. C. Reilly (1980). "The cost of outpatient physicians' services at a Veterans Administration hospital." *Annals of Internal Medicine* 93(1): 128-132.

The cost of an average outpatient visit to a physician at a Veterans Administration hospital in 1976 was estimated from hospital records to have been \$80.35 (\$104.46 in 1979 dollars). When productivity was used to measure relative cost, cost per visit ranged from a low of \$32.66 (1979: \$42.46) for hypertension clinic to a high of \$243.48 (1979: \$316.52) for hematology clinic. The average patient was seen 12.6 times annually at a cost of \$1012 (1979: \$1315). The major cost category for a physician visit was salaries, with nonphysician salaries costing twice as much as physician salaries. The cost of medical equipment was minimal. The findings suggest that the outpatient bookkeeping system was inadequate for cost accounting, the cost per visit was expensive, there were an excessive number of visits, and problems in the institutional delivery system of ambulatory care lowered productivity of physicians.

Rosenheck, R., J. Cramer, et al. (1999). "Cost-effectiveness of clozapine in patients with high and low levels of hospital use." *Archives of General Psychiatry* 56(6): 565-572.

**BACKGROUND:** This study examined the relationship between pretreatment hospital use and the cost-effectiveness of clozapine in the treatment of refractory schizophrenia. **METHODS:** Data from a 15-site randomized clinical trial were used to

compare clozapine with haloperidol in hospitalized Veterans Affairs patients with refractory schizophrenia (n = 423). Outcomes were compared among those with many days in the hospital use (hereafter, high hospital users) (n = 141; mean = 215 psychiatric hospital days in the year prior to study entry) and those with few days in the hospital use (hereafter, low hospital users) (n = 282; mean = 58 hospital days). Analyses were conducted with the full intention-to-treat sample (n = 423) and with crossovers excluded (n = 291). RESULTS: Clozapine treatment resulted in greater reduction in hospital use among high hospital users (35 days less than controls, P = .02) than among low users (21 days less than controls, P = .05). Patients taking clozapine also had lower health care costs; after including the costs of both medications and other health services, costs were \$7134 less than for controls among high hospital users (P = .14) but only \$759 less than for controls among low hospital users (P = .82). Clinical improvement in the domains of symptoms, quality of life, extrapyramidal symptoms, and a synthetic measure of multiple outcomes favored clozapine in both high and low hospital user groups. CONCLUSIONS: Substantial 1-year cost savings with clozapine are observed only among patients with very high hospital use prior to initiation of treatment while clinical benefits are more similar across groups. Cost-effectiveness evaluations, and particularly studies of expensive treatments, cannot be generalized across type of use groups.

Rosenheck, R., J. Cramer, et al. (1998). "Multiple outcomes assessment in a study of cost-effectiveness of Clozapine in the treatment of refractory schizophrenia." *Health Services Research* 33(5): 1237-1261.

OBJECTIVE: To develop new methods for combining results from multiple outcome domains and to demonstrate their application in a study of the cost-effectiveness of clozapine in treating hospitalized patients with refractory schizophrenia. DATA SOURCES/STUDY SETTING: Interview assessments, and administrative utilization and cost data, concerning 423 patients with refractory schizophrenia who had been hospitalized for 30-364 days during the year before study entry, at 15 VA medical centers. STUDY DESIGN: A 12-month double-blind trial compared clozapine (n = 205) and haloperidol (n = 218) in the treatment of refractory schizophrenia. DATA COLLECTION/EXTRACTION METHODS: Data from standard assessment instruments, gathered at baseline and at 6 weeks, and at 3, 6, 9, and 12 months, were used to develop a Composite Health Index for Schizophrenia, a measure that addresses outcome in six domains, weighted by patient or provider preferences. Cumulative improvement was estimated by computing the area under the improvement curve. This measure was then combined with cost data, reflecting consumption of societal resources to estimate incremental cost-effectiveness ratios. PRINCIPAL FINDINGS: Clozapine was significantly more effective than haloperidol on measures of symptoms (p = .02) and side effects (p < .0001), with nonsignificant trends in the positive direction on community role functioning (p = .06), family relationships (p = .23), social relationships (p = .30), and daily activities (p = .20). Clozapine was also more effective than haloperidol on the one-year cumulative Composite Health Index for Schizophrenia (p < .0001 for all weighting schemes). After converting this measure to a 0-1 Worst Health-Good Health Scale analogous to Quality Adjusted Life Years, clozapine was found to yield a small improvement of .049 Worst Health-Good Health Units as compared to an improvement of only .027 Units for haloperidol (p < .0001). Average annual costs were \$2,733 lower

for clozapine (95% C.I. = -\$9,220 to \$3,754). Although clozapine was significantly more effective than haloperidol, the summary cost-effectiveness ratio had a wide 95 percent confidence interval ranging from -\$431,585 to \$177,352. CONCLUSIONS: Methods demonstrate an approach to using conventional disease-specific measures to evaluate the cumulative effectiveness of novel treatments for psychotic disorders and for expressing their economic effect as cost-effectiveness ratios. Among high hospital users with refractory schizophrenia, clozapine is more cost-effective than standard treatment, although the magnitude of its effect is small and there is considerable uncertainty about the cost estimates.

Rosenheck, R., J. Cramer, et al. (1997). "A comparison of clozapine and haloperidol in hospitalized patients with refractory schizophrenia. Department of Veterans Affairs Cooperative Study Group on Clozapine in Refractory Schizophrenia." *N Engl J Med* 337(12): 809-815.

BACKGROUND: Clozapine, a relatively expensive antipsychotic drug, is widely used to treat patients with refractory schizophrenia. It has a low incidence of extrapyramidal side effects but may cause agranulocytosis. There have been no long-term assessments of its effect on symptoms, social functioning, and the use and cost of health care. METHODS: We conducted a randomized, one-year, double-blind comparative study of clozapine (in 205 patients) and haloperidol (in 218 patients) at 15 Veterans Affairs medical centers. All participants had refractory schizophrenia and had been hospitalized for the disease for 30 to 364 days in the previous year. All patients received case-management and social-rehabilitation services, as clinically indicated. RESULTS: In the clozapine group, 117 patients (57 percent) continued their assigned treatment for the entire year, as compared with 61 (28 percent) of the patients in the haloperidol group ( $P<0.001$ ). As judged according to the Positive and Negative Syndrome Scale of Schizophrenia, patients in the clozapine group had 5.4 percent lower symptom levels than those in the haloperidol group at all follow-up evaluations (mean score, 79.1 vs. 83.6;  $P=0.02$ ). The differences on a quality-of-life scale were not significant in the intention-to-treat analysis, but they were significant among patients who did not cross over to the other treatment ( $P=0.003$ ). Over a one-year period, patients assigned to clozapine had fewer mean days of hospitalization for psychiatric reasons than patients assigned to haloperidol (143.8 vs. 168.1 days,  $P=0.03$ ) and used more outpatient services (133.6 vs. 97.9 units of service,  $P=0.03$ ). The total per capita costs to society were high -- \$58,151 in the clozapine group and \$60,885 in the haloperidol group ( $P=0.41$ ). The per capita costs of antipsychotic drugs were \$3,199 in the clozapine group and \$367 in the haloperidol group ( $P<0.001$ ). Patients assigned to clozapine had less tardive dyskinesia and fewer extrapyramidal side effects. Agranulocytosis developed in three patients in the clozapine group; all recovered fully. CONCLUSIONS: For patients with refractory schizophrenia and high levels of hospital use, clozapine was somewhat more effective than haloperidol and had fewer side effects and similar overall costs.

Rosenheck, R., L. Frisman, et al. (1995). "Effectiveness and cost of specific treatment elements in a program for homeless mentally ill veterans." *Psychiatric Services* 46(11): 1131-1139.

**OBJECTIVES:** The study examined relationships between specific treatment elements and their costs and ten outcome measures using data from a longitudinal outcome study of a Veterans Affairs program for homeless mentally ill veterans. **METHODS:** Baseline and outcome data over an eight-month period were analyzed for 406 homeless veterans with psychiatric and substance use disorders who were treated in VA's Homeless Chronically Mentally Ill Veterans Program. Multivariate techniques were used to examine the relationship between ten measures of outcome and six treatment elements: program entry via community outreach, the number of contacts with program clinicians, the number of referrals for other services, duration of program involvement, number of days of residential treatment, and increased public support payments. **RESULTS:** Each of the six treatment elements was significantly related to improvement on at least one of the ten outcome measures. The number of clinical contacts with program staff and the number of days in residential treatment were associated with improvement in the greatest number of outcome domains. However, improvement associated with residential treatment was far more costly than improvement related to other treatment elements. **CONCLUSION:** This study provides evidence of the effectiveness of a multimodal approach to the treatment of homeless mentally ill persons. However, results indicate that special attention should be paid to differences in the cost of improvement associated with various treatment elements.

Rosenheck, R., P. Gallup, et al. (1993). "Health care utilization and costs after entry into an outreach program for homeless mentally ill veterans." *Hospital and Community Psychiatry* 44(12): 1166-1171.

**OBJECTIVE:** This study evaluated the impact of a Department of Veterans Affairs outreach and residential treatment program for homeless mentally ill veterans on utilization and cost of health care services provided by the VA. **METHODS:** Veterans at nine program sites (N = 1,748) were assessed with a standard intake instrument. Services provided by the outreach program were documented in quarterly clinical reports and in residential treatment discharge summaries. Data on nonprogram VA health service utilization and health care costs were obtained from national VA data bases. Changes in use of services and cost of services from the year before initial contact with the program to the year after were analyzed by t test. Multivariate analyses were used to examine the relationship of these changes to indicators of clinical need and to participation in the outreach program. **RESULTS:** Although utilization of inpatient service did not increase after veterans' initial contact with the program, use of domiciliary and outpatient services increased substantially. Total annual costs to the VA also increased by 35 percent, from \$6,414 to \$8,699 per veteran per year. Both clinical need and participation in the program were associated with increased use of health services and increased cost. Veterans with concomitant psychiatric and substance abuse problems used fewer health care services than others. **CONCLUSIONS:** Specialized programs to improve the access of homeless mentally ill persons to health care services appear to be effective, but costly. Dually diagnosed persons seem especially difficult to engage in treatment.

Rosenheck, R., D. Leslie, et al. (2001). "From clinical trials to real-world practice: use of atypical antipsychotic medication nationally in the Department of Veterans Affairs." *Medical Care* 39(3): 302-308.

**BACKGROUND:** Although clinical trials evaluate pharmacotherapeutic interventions under highly controlled conditions, there remains a need to evaluate medication use in actual practice. **METHODS:** Patients prescribed atypical antipsychotic medications in the VA system during a 4-month period in 1999 (n = 73,981) were classified into 32 groups on the basis of clinical diagnosis and recent level of inpatient use. Variation was examined across groups in drug costs, agents, dosages, and duration of use. The potential impact of these medications on VA costs was estimated by calculating medication costs and subtracting estimated inpatient savings. **RESULTS:** A majority of patients were diagnosed with schizophrenia (57.2%), but substantial off-label use of these medications to treat other psychiatric illnesses was also evident (42.8%). Compared with published trials reporting average annual costs from \$3,000 to \$7,000, average annualized pharmacy costs were only \$1,395 per patient because of a 58.5% VA price discount; relatively low dosing, especially for people with diagnoses other than schizophrenia; and medication prescription coverage for only 75% of the days in the study period. The sample averaged only 6.96 inpatient days; as a result, potential inpatient savings were limited. Assuming 0% to 18% inpatient savings, annual net drug costs are estimated to range from \$500 to \$1,152 per patient. **CONCLUSIONS:** Medication costs in actual practice can be substantially lower than in clinical trials. Atypical antipsychotic medications in actual VA practice incur net costs estimated at \$500 to \$1,152 per patient per year with substantial variation across clinical subgroups.

Rosenheck, R., L. Massari, et al. (1990). "The impact of DRG-based budgeting on inpatient psychiatric care in Veterans Administration medical centers." *Medical Care* 28(2): 124-134.

In 1985 the Veterans Administration (VA) implemented a prospective budgeting system for acute inpatient care based on diagnosis-related groups (DRGs). To assess the impact of this system on psychiatric care, this study reviewed data on all VA discharges for psychiatric or substance abuse disorders that occurred during the four years before and the four years after this system was implemented. During the four years following the implementation of DRG-based budgeting the number of annual discharges increased by 28.7% and the number of unique patients discharged increased by 15.5%. Average lengths of stay declined by 36.9% and total annual bed days of care per unique patient declined by 29.7%. These changes occurred in association with an 11.5% reduction in the total number of beds occupied by psychiatric patients, an 8.9% reduction in direct per diem expenditures for psychiatric care nationally, and a 32.7% decline in direct expenditures per episode, after adjustment is made for inflation. In spite of a continuing decline in the value of the available resources, largely due to the effect of inflation, prospective budgeting appears to have had a major impact on the pattern of inpatient psychiatric care in this large health care system.

Rosenheck, R., L. Massari, et al. (1993). "Who should receive high-cost mental health treatment and for how long?" *Schizophrenia Bulletin* 19(4): 843-852.

The use of some recently developed and promising mental health treatments is likely to be restricted by their high cost. Cost-effectiveness studies, however, suggest that high treatment costs may be offset by associated reductions in inpatient service use. In view of the considerable variation in the cost of inpatient treatment for the mentally ill, it

may be cost-efficient to use high-cost treatments for frequent hospital users but not for others. To illustrate this principle, we examine 9-year trends in inpatient costs incurred by schizophrenia patients discharged from Department of Veterans' Affairs medical centers across the country in fiscal year (FY) 1982. Even in the absence of specific intervention, average inpatient costs in this sample fell 49 percent, from \$7,368 per patient in FY 1983 to \$3,770 per patient in FY 1990, reducing the potential for inpatient cost offsets over time. Sensitivity analyses of potential inpatient cost offsets were conducted using a range estimate both for the cost of treatment and for resulting reductions in inpatient expense. Assuming effectiveness in a middle range, high-cost intervention was projected to be cost-neutral for the 25 percent of the sample with the highest rates of baseline hospital use for a duration of 1-3 years. Although our specific model had low predictive power, the projection of cost offsets in large mental health systems deserves further examination and may prove to be one useful criterion, in addition to clinical effectiveness, for selecting patients to receive expensive treatment.

Rosenheck, R., M. Neale, et al. (1995). "Estimating the capital component of mental health care costs in the public sector." *Administration and Policy in Mental Health* 21(6): 493-509.

This study describes methods for determining the cost of buildings and grounds in public sector facilities. Two methods for estimating the cost of capital (one using local office rents; the other based on estimates of the replacement cost of hospital buildings) are applied to six types of health care service at nine VA medical centers. Results indicate that capital costs for psychiatric inpatient care were about one-third those for surgical services and one-half those for medical services. Overall, capital costs add 6% to average inpatient costs and 4% to outpatient costs.

Rosenheck, R., M. Neale, et al. (1995). "Issues in estimating the cost of innovative mental health programs." *Psychiatric Quarterly* 66(1): 9-31.

This paper reviews problems encountered in estimating the unit cost of services provided by innovative mental health programs and illustrates methods for addressing these problems. Generally, the cost of a health care service is determined by identifying all resources used in its production and the cost of those resources. These costs are divided by appropriate workload measures to determine the cost per unit of service or per client. Issues that must be addressed include: 1) direct program costs; 2) indirect costs (including administration and capital costs); 3) program resources used to support research and other non-program activities; and 4) identification of "typical" workloads as the program is implemented. Application of these methods is illustrated with data from a multi-site study of intensive psychiatric community care conducted at nine Department of Veterans Affairs Medical Centers in the Northeast. A sensitivity analysis revealed that estimates of program costs vary by 59% over the entire program, and from 17%-168% at individual sites, depending on which cost estimation methods were included. The average cost of case management in this program varied considerably across sites, primarily reflecting differences in caseload size and staffing levels. Adjusting for inflation, the cost of this program falls below the cost of other published intensive community programs.

Rosenheck, R., M. Neale, et al. (1995). "Multisite experimental cost study of intensive psychiatric community care." *Schizophrenia Bulletin* 21(1): 129-140.

A 2-year experimental cost study of 10 Intensive Psychiatric Community Care (IPCC) programs was conducted at Department of Veterans Affairs (VA) medical centers in the Northeast. High hospital users were randomly assigned to either IPCC (n = 454) or standard VA care (n = 419) at four neuropsychiatric (NP) and six general medical and surgical (GMS) hospitals. National computerized data were used to track all VA health care service usage and costs for 2 years following program entry. At 9 of the 10 sites, IPCC treatment resulted in reduced inpatient service usage. Overall, for IPCC patients compared with control patients, average inpatient usage was 89 days (33%) less while average cost per patient (for IPCC inpatient, and outpatient services) was \$15,556 (20%) less. Additionally, costs for IPCC patients compared with control patients were \$33,295 (29%) less at NP sites but were \$6,273 (15%) greater at GMS sites. At both NP and GMS sites, costs were lower for IPCC patients in two subgroups: veterans over age 45 and veterans with high levels of inpatient service use before program entry. No interaction was noted between the impact of IPCC on costs and other clinical or sociodemographic characteristics. Similarly, no linear relationship was observed between the intensity of IPCC services and the impact of IPCC on VA costs, although the two sites that did not fully implement the IPCC program had the poorest results. With these sites excluded, the total cost of care for IPCC patients at GMS sites was \$579 (3%) more per year than that for the control patients.

Rosenheck, R. and C. L. Seibyl (1998). "Homelessness: health service use and related costs." *Medical Care* 36(8): 1256-1264.

**OBJECTIVES:** This study examines health service use and costs for homeless and domiciled veterans hospitalized in psychiatric and substance abuse units at Department of Veterans Affairs (VA) medical centers, nationwide. **METHODS:** A national survey of residential status at the time of admission was conducted on all VA inpatients hospitalized in acute mental health care units on September 30, 1995. Survey data were merged with computerized workload data bases to assess service use and cost during the 6 months before and after the date of discharge from the index hospitalization. **RESULTS:** Of 9,108 veterans with complete survey data, 1,797 (20%) had been literally homeless at the time of admission, and 1,380 (15%) were doubled up temporarily, for a total homelessness rate of 35%. Combining patients from general psychiatry and substance abuse programs, the average annual cost of care for homeless veterans, after adjusting for other factors, was \$27,206; \$3,196 (13.3%) higher than the cost of care for domiciled veterans ( $P < 0.0001$ ). Approximately 26% of annual inpatient VA mental health expenditures (\$404 million) are spent on the care of homeless persons. **CONCLUSIONS:** Homelessness adds substantially to the cost of health care services for persons with mental illness in VA, and most likely, in other "safety net" systems that serve the poor. These high costs, along with the prospect of declining public funding for health and social welfare programs, and an anticipated increase in the numbers of homeless mentally ill persons, portend a difficult time ahead for both homeless patients and the organizations that care for them.

Schneiderman, L. J., R. Kronick, et al. (1992). "Effects of offering advance directives on medical treatments and costs." *Annals of Internal Medicine* 117(7): 599-606.

**OBJECTIVE:** To examine the effects of advance directives on medical treatments and on patient satisfaction and well-being and to determine whether the enhancement of patient autonomy through advance directives provides a more ethically feasible approach to cost control than does the imposition of limits through rationing. **DESIGN:** Randomized, controlled trial. **SETTING:** University and Veterans Affairs medical center. **PATIENTS:** Two hundred and four patients with life-threatening illnesses, 100 of whom died after enrollment in the study. **INTERVENTION:** Patients randomly assigned to the experimental group were offered the California Durable Power of Attorney (a typical proxy-instruction directive), and patients assigned to the control group were not offered the advance directive. Hospital admissions were monitored to assure that a summary of the document was present in the active medical record at each hospitalization. **MEASUREMENTS:** Cognitive function, patient satisfaction, psychological well-being, health locus of control, sense of coherence, health-related quality of life, receipt of medical treatments, and medical treatment charges. **RESULTS:** No significant differences were found between advance-directive and control groups regarding psychosocial variables, health outcome variables, and medical treatments or charges. Patients offered an advance directive had an average hospital stay of 40.8 days (95% CI, 32.2 to 49.4 days), compared with an average of 33.1 days (95% CI, 26.0 to 40.2 days) for controls. Patients offered an advance directive were charged an average of \$19,502 (95% CI, \$13,030 to \$25,974) for medical treatments in the last month of life compared with \$19,700 (95% CI, \$13,704 to \$25,696) for controls. **CONCLUSIONS:** Despite claims that public demand for longer life accounts for rising medical costs, most surveys suggest that patients are calling for less, not more, of the expensive, high-technology treatment often used in terminal phases of illness. Executing the California Durable Power of Attorney for Health Care and having a summary copy placed in the patient's medical record had no significant positive or negative effect on a patient's well-being, health status, medical treatments, or medical treatment charges.

Shephard, D. S., W. B. Stason, et al. (1995). "Multivariate cost-effectiveness analysis: an application to optimizing ambulatory care for hypertension." *Inquiry* 32(3): 320-331.

Cost-effectiveness analysis (CEA) is being used increasingly to allocate health resources efficiently. This paper develops an extension of CEA based on multivariate regression analysis and applies it to hypertension treatment. After assembling clinic and patient characteristics, outcomes, and costs for 2,439 randomly chosen patients in the 32 special hypertension clinics of the Department of Veterans Affairs (VA), we identified 19 significant predictors of cost and diastolic blood pressure (DBP) using multiple regression analysis. We classified these independent variables as "unambiguous" if a given change was associated with both lower cost and better DBP, or as "trade-off" variables if any change improving DBP entailed higher costs. The results suggest that fully implementing all unambiguous clinic changes would reduce costs by 33% while improving DBP. Multivariate CEA could help managed care companies and government programs with cost and outcome data to reduce costs and improve outcomes.

Smith, M. E., C. R. Baker, et al. (1992). "Case-mix groups for VA hospital-based home care." *Medical Care* 30(1): 1-16.

The purpose of this study is to group hospital-based home care (HBHC) patients homogeneously by their characteristics with respect to cost of care to develop alternative case mix methods for management and reimbursement (allocation) purposes. Six Veterans Affairs (VA) HBHC programs in Fiscal Year (FY) 1986 that maximized patient, program, and regional variation were selected, all of which agreed to participate. All HBHC patients active in each program on October 1, 1987, in addition to all new admissions through September 30, 1988 (FY88), comprised the sample of 874 unique patients. Statistical methods include the use of classification and regression trees (CART software: Statistical Software; Lafayette, CA), analysis of variance, and multiple linear regression techniques. The resulting algorithm is a three-factor model that explains 20% of the cost variance ( $R^2 = 20\%$ , with a cross validation  $R^2$  of 12%). Similar classifications such as the RUG-II, which is utilized for VA nursing home and intermediate care, the VA outpatient resource allocation model, and the RUG-HHC, utilized in some states for reimbursing home health care in the private sector, explained less of the cost variance and, therefore, are less adequate for VA home care resource allocation.

Stajduhar, P., J. A. Deneselya, et al. (1996). "Alternative tertiary care pathways for a rural Department of Veterans Affairs Medical Center." *American Journal of Medical Quality* 11(3): 146-150.

This study addresses the cost of rural health care delivery where veterans do not have ready access to tertiary Department of Veterans Affairs Medical Centers (VAMCs) but where local community health care is available. The study sample was 209 patients referred for tertiary care to a VAMC 50 miles distant from the referring rural VAMC. The cost of tertiary referral VAMC care was retrospectively compared with the cost had the patients received the tertiary care in the local community hospital located in the immediate vicinity. In addition, the cost of travel resulting from the remote access was also computed. Findings indicate that a savings of +309,293 could have been obtained had a local community hospital provided the tertiary care utilizing the Health Care Financing Administration Medicare rate. Data generated by the methodology of this study are expected to provide a baseline for policy decisions relating to alternative pathways for tertiary care in the Department of Veterans Affairs.

Stason, W. B., D. S. Shepard, et al. (1994). "Effectiveness and costs of veterans affairs hypertension clinics." *Medical Care* 32(12): 1197-1215.

The effectiveness and costs of care for hypertension are examined in a stratified random sample of 3,087 patients from a network of 32 Veterans Affairs Hypertension Screening and Treatment Clinics (HSTP). During 2.5 years of follow-up, 66% and 88% of patients, respectively, had mean diastolic blood pressure (DBP) levels of 90 or 95 mm Hg or less; 73% remained fully in care; and the mean cost of ambulatory care per patient-year was \$647 in 1989 dollars. Higher follow-up DBP levels were found in patients who were younger, had higher DBP levels, or were receiving medication on their first visits to a clinic, were receiving more intense treatment regimens at the beginning of the follow-up period, or had been under the care of the clinic for shorter periods. Patients who were

more likely to remain in care were older, received more intense treatment regimens, had prior cardiovascular complications, or had been under the care of the clinic for a longer time. Higher annual costs were associated with higher entry DBP levels, shorter durations of care, more intense regimens, and prior cardiovascular complications. Overall, patient characteristics explained 13% of the variance in mean follow-up DBP, and 31% of variance in costs. Wide variations were found among clinics in clinical outcomes and costs. After controlling for differences in patient characteristics, clinic characteristics associated with better blood pressure control were more frequent clinic visits, shorter waiting times, more time spent in patient counseling, having therapists who had a single supervisor, and better staff satisfaction.(ABSTRACT TRUNCATED AT 250 WORDS)

Stefos, T., N. LaVallee, et al. (1992). "Fairness in prospective payment: a clustering approach." *Health Services Research* 27(2): 239-261.

Problems of fairness in prospective payment have existed since the inception of this regulatory method in the early 1980s. While prospective payment ostensibly has sought to reward efficient producers and provide disincentives for inefficient producers of health care, many hospitals have been penalized financially as a consequence of facing systematic factors beyond their control. This article defines homogenous peer groups of Department of Veterans Affairs providers for the purpose of establishing competitive prospective reimbursement rates. An econometric analysis classifies hospitals into six categories: small affiliated, small general, midsize affiliated/tertiary, large affiliated/tertiary, midsize general, and psychiatric. The Department of Veterans Affairs adopted this classification to alter its prospective payment system in 1988.

Swindle, R. W., Jr., M. C. Beattie, et al. (1996). "The quality of cost data. A caution from the Department of Veterans Affairs experience." *Medical Care* 34(3 Suppl): MS83-MS90.

Many health care system, including that of the Department of Veterans Affairs (VA), are facing dramatic changes as they adapt to state-level reform legislation and move into managed care environments. As new costing systems are designed and as researchers seek to conduct cost-effectiveness studies to guide health policy, it is critical to examine the assumed validity of the measurement procedures on which these costing systems are based. The foundation for VA health care costing is the cost distribution report, which is created by combining data on expenditures and workload with local service chiefs' estimates of program staffing and resource use. To evaluate the accuracy of the cost distribution report, the authors compared data from the report to cost data obtained in three multisite studies. Substantial differences were found between the cost distribution report and these independent sources, suggesting that researchers should not place uncritical reliance on the cost distribution report. The accuracy of costing data in information systems being implemented by VA will be limited to the extent they rely on the existing VA cost distribution system. Several strategies can be used in studies with a cost component to compensate for imperfect cost distribution systems.

Toseland, R. W., O. D. J. C., et al. (1997). "Outpatient geriatric evaluation and management: is there an investment effect?" *Gerontologist* 37(3): 324-332.

The effectiveness and efficiency of outpatient geriatric evaluation and management (GEM) was compared to usual outpatient primary care (UPC). Although GEM had no overall impact on health care utilization or cost of care for the entire study period, significant reductions were found during the sixteen- to twenty-four-month study period, suggesting a possible investment effect. In the first eight months of the study, GEM patients incurred 34.8% more in health care costs than UPC patients, but in the final eight months of the study the cost of care for UPC patients exceeded that for GEM patients by 37.8%.

U.S. Dept. of Veterans Affairs, M. S. G. (1991). A comparison of the operating costs and performance of VA and nonfederal hospitals: 1984-1988. Bedford, MA, Management Science Group.

[from the Executive Summary:] The decade of the 1980s was marked by increasing involvement of government in the development of reimbursement systems designed to control the rapid rise in growth of hospital costs. Medicare's adoption of Diagnosis-Related Groups (DRGs) in 1983 was followed one year later by the VA's introduction of the Resource Allocation Methodology (RAM). In the interest of contrasting two distinct U.S. systems of hospitalization, this study compares the operating costs and general performance of VA hospitals with nonfederal hospitals for the years 1984 through 1988.

US Department of VA, O. o. H. I. (1993). Comparison of costs of VA care with private sector costs. Washington, D.C.

US Department of Veterans Affairs, O. o. H. C. I. (1992). Comparison of costs and outcomes of matched pairs of VAMCs and their university affiliates. Washington D.C., Office of Health Care Inspections.

Volicer, L., A. Collard, et al. (1994). "Impact of special care unit for patients with advanced Alzheimer's disease on patients' discomfort and costs." *Journal of the American Geriatric Society* 42(6): 597-603.

**OBJECTIVE:** To compare outcomes in patients with the clinical diagnosis of probable dementia of the Alzheimer type (DAT) cared for in a Dementia Special Care Unit (DSCU) with those in traditional long-term care (TLTC). **DESIGN:** Two-year prospective cohort study. **SETTING:** Two Veterans Administration Hospitals. The DSCU concentrated on assuring patients' comfort instead of promoting maximal survival; in some patients this excluded transfer to acute medical settings, the use of antibiotics, and tube feeding. **MEASUREMENTS:** Data were collected regarding disease severity, patient discomfort, use of medical resources, and mortality rate. **RESULTS:** Patients at both settings were similar on baseline measures, and most were severely demented. The monthly levels of observed discomfort were lower in DSCU than in TLTC patients. The costs of medications, radiology, and laboratory procedures were lower in DSCU than in TLTC patients. DSCU patients were also transferred less frequently to an acute medical setting. The average 3-month cost for a DSCU patient was \$1477 less than the cost of care for a TLTC patient. However, DSCU patients with lower severity of DAT had a higher mortality rate than TLTC patients. **CONCLUSIONS:** These results suggest that

management of patients with advanced DAT on a DSCU using a palliative care philosophy may result in less patient discomfort and lower costs than management on a TLTC.

Wade, T. P., K. S. Virgo, et al. (1996). "Outcomes after detection of metastatic carcinoma of the colon and rectum in a national hospital system." *Journal of the American College of Surgery* 182(4): 353-361.

**BACKGROUND:** Selected institutions have reported good results with resection for metastatic carcinoma of the colon and rectum, but the number of patients and the expenses required to identify the resectable metastases are unknown. **STUDY DESIGN:** A retrospective survival analysis was performed using computerized files of the United States Department of Veterans Affairs hospitals from 1988 to 1992, complete through December 1994. Survival was calculated from diagnosis or resection until death. Patients without a death record were assumed to be alive. **RESULTS:** In all, 22,715 patients underwent colectomy for carcinoma, and 12,150 presented with metastatic carcinoma of the colon and rectum, of which 6,607 had hepatic and 2,659 had pulmonary metastases. Only 2,040 patients with hepatic (and 514 with pulmonary metastases had no prior or other metastatic sites. Of the patients with hepatic metastases, 887 had a computed tomography (CT) scan or liver biopsy, or both, for diagnosis; 133 hepatic and 76 pulmonary resections were done. The projected five-year survival rate after hepatic resection was 26 percent, mean survival was 31 months, and the 30-day mortality rate was 4 percent. After pulmonary resection, results were similar: 36 percent, 38 months, and 3 percent, respectively. The 887 patients with hepatic metastases documented by CT scan or biopsy results has a mean survival of 11 months, and less than 2 percent were alive or unavailable for follow-up examination at analysis. Estimated surveillance costs alone averaged \$1.3 million per life saved by resection, or \$203,000 per year of added life. **CONCLUSIONS:** Resection of isolated colorectal metastases produced 70 five-year survivors (hepatic, n=42, pulmonary, n=28) and accounted for 446 additional years of patient life over that expected without resection.

Wasson, J., C. Gaudette, et al. (1992). "Telephone care as a substitute for routine clinic follow-up." *JAMA* 267(13): 1788-1793.

**DESIGN--**Randomized trial. **SETTING--**A primary care clinic. **PATIENTS--**Four hundred ninety-seven men aged 54 years or older. **OBJECTIVE--**We examined the hypothesis that substituting clinician-initiated telephone calls (telephone care) for some clinic visits would reduce medical care utilization without adversely affecting patient health. **INTERVENTION--**Clinicians were asked to double their recommended interval for face-to-face follow-up and schedule three intervening telephone contacts; for control patients, the follow-up interval recommended by their clinician was unchanged. **MAIN OUTCOME MEASURES--**Use of medical services and health status. **RESULTS--**During the 2-year follow-up period, 7% of patients withdrew or became unavailable. Telephone-care patients had fewer total clinic visits, scheduled and unscheduled, than usual-care patients (19%,  $P$  less than .001). In addition, telephone-care patients had less medication use (14%,  $P$  = .006), fewer admissions, and shorter stays in the hospital (28% fewer total hospital days,  $P$  = .005), and 41% fewer intensive care unit days ( $P$  = .03). Estimated total expenditures for telephone care were 28% less per patient for the 2 years (\$1656,  $P$  =

.004). For the subgroup of patients with fair or poor overall health at the beginning of the study ( $n = 180$ ), savings were somewhat greater (\$1976,  $P = .01$ ). In this subgroup, improvement in physical function from baseline ( $P = .02$ ) and a possible reduction in mortality ( $P = .06$ ) were also observed. CONCLUSION--We conclude that substituting telephone care for selected clinic visits significantly reduces utilization of medical services. For more severely ill patients, the increased contact made possible by telephone care may also improve health status and reduce mortality.

Weaver, F. M., K. J. Conrad, et al. (1996). "Evaluation of a prospective payment system for VA contract nursing homes." *Evaluation and the Health Professions* 19(4): 423-442.

An evaluation of a pilot program for community nursing home care reimbursement by Department of Veterans Affairs Medical Centers (VAMCs) was undertaken. Eight VAMCs began using the Enhanced Prospective Payment System (EPPS) in 1992. These sites were compared to eight customary payment sites in a pretest/posttest quasi-experimental design. Outcomes included access to care, administrative workload, quality of care, and cost. As expected, per diem costs were significantly higher for EPPS than customary reimbursement patients (\$106 vs. \$87). However, EPPS sites placed veterans more quickly (81 days vs. 113 days;  $p < .01$ ) than comparison sites and reduced administrative workload associated with placement. EPPS sites also increased the number of Medicare-certified homes under contract (76% vs. 54%) and placed significantly more veterans who received therapy (20% vs. < 1%). Savings in hospital days more than offset the increased cost of nursing home placement. Because the findings were attributed largely to a few veterans with long lengths of hospital stay, the early success of EPPS may diminish as the backlog of these long-stay patients decreases.

Willenbring, M. L. and D. H. Olson (1999). "A randomized trial of integrated outpatient treatment for medically ill alcoholic men." *Archives of Internal Medicine* 159(16): 1946-1952.

BACKGROUND: Medically ill alcoholics often do not respond to conventional alcoholism treatment or decline physician referrals. Integrated outpatient treatment (IOT), a new treatment specifically designed for this population, combines comprehensive medical care with alcoholism interventions. OBJECTIVE: To compare the efficacy of IOT with that of standard treatment approaches. METHODS: One hundred five male veterans with severe medical complications caused by alcoholism and recent drinking were randomly assigned to receive IOT or referral to standard alcoholism and medical treatment and were evaluated over 2 years. Integrated outpatient treatment patients received medical care and alcoholism interventions once or twice monthly. Patients in the control group were referred for alcoholism treatment, but few accepted. However, patients in the control group did engage in outpatient medical care. RESULTS: At baseline, the mean  $\pm$  SD age of the control group was  $57.2 \pm 10.0$  years, compared with  $52.8 \pm 11.5$  years in the IOT group ( $P = .04$ ). The groups were well matched in other respects. The mean  $\pm$  SD number of visits over 2 years for the IOT patients was  $42.2 \pm 29.1$ , compared with  $17.4 \pm 15.6$  for the control patients ( $P < .001$ ); the frequency of hospital use was similar in both groups. After 2 years, 28 (74%) of 38 surviving IOT patients and 17 (47%) of 36 control patients were abstinent ( $P = .02$ ). Nearly twice as

many control patients (30% [n = 16]) as IOT patients (18% [n= 9]) died, but the results of Cox survival analysis were not significant. There were no differences in symptoms of alcohol dependence, quality of life, or life problems. The incremental cost of IOT was approximately \$1100 per patient per year. CONCLUSIONS: Standard medical care alone was surprisingly effective in inducing abstinence in surviving medically ill alcoholics. Integrated outpatient treatment significantly increased both engagement and abstinence for a modest annual cost. Further refinement and testing of IOT is indicated.

Witkin, M. J., J. E. Atay, et al. (1994). "The effect of inflation on expenditures by mental health organization between 1969 and 1990." *Mental Health Statistical Note*(212): 1-6.

[From the Summary and Conclusions:]

At first glance, the rise in current dollar expenditures for all mental health organizations from \$3.3 billion in 1969 to \$28.4 billion in 1990 seems enormous. However, if the annual expenditures are adjusted for inflation and expressed in constant dollars, the rise in expenditures is only from \$3.3 billion in 1969 to \$5.6 billion in 1990. Thus, most of the increase in expenditures by mental health organizations over the past two decades is due to inflation, with less than 10 percent due to increases in real purchasing power. Since both the number of private psychiatric hospitals and the expenditures they incurred increased dramatically between 1969 and 1990, these hospitals showed gains in absolute dollar amounts and in dollar amounts per capita, even if the expenditures are expressed in constant dollars. To a lesser extent, the same was true of RTCs. Although both VA medical centers and State mental hospitals showed increases in expenditures as measured in current dollars, if expenditures are expressed in constant dollars, these organizations showed net decreases. Their inpatient populations also decreased during this period. However, if expenditures per inpatient under care are examined, the reverse is true. The per patient expenditures for State mental hospitals increased between 1969 and 1990, even if the results are stated in constant dollars.(ABSTRACT TRUNCATED AT 250 WORDS)

Wray, N. P., T. J. Weiss, et al. (1999). "Evaluation of the VA mobile clinics demonstration project." *Journal of Healthcare Management* 44(2): 133-147.

In 1988 the Veterans' Benefits and Services Act attempted to solve the problem of the lack of adequate VA healthcare facilities in rural areas by establishing a demonstration program using mobile clinics. Six clinics operated in areas that were at least 100 miles from a VA healthcare facility during the time period between October 1, 1992 and May 28, 1994. This article evaluated the effect of the mobile clinics' structural limitations on clinical care, the increased number of sites on VA usage, and cost. Limited space for storage of medical records and the unavailability of laboratory, electrocardiographic, or radiographic facilities significantly affected clinical practice. However, even with these space limitations, veterans' use of healthcare in the areas served by the mobile clinics increased significantly in comparison to reference areas. The direct costs per visit averaged more than three times what the VA would have reimbursed the private sector.